How the gel tolled for U S West ■ Plug-and-play ADSL deployment

America's Network

SEPTEMBER 15, 1997 TECHNOLOGY FOR THE PUBLIC NETWORK SINCE 1909 CAN $5.95 • US $4.95

Sonet symphony

New ways to manage and monitor network performance

AN ADVANSTAR PUBLICATION

Dorothy Deavers
Internet Addict

"1.5 Mbps wasn't fast enough for me."

ADSL from Ericsson – the obvious choice.

No matter what kind of services your customers want, they want them fast. And nothing is faster than ADSL from Ericsson. With ADSL, your customers get access speeds of 8 Mbps and more — over their existing copper telephone lines. Because voice and data can be transmitted simultaneously, your customers can talk on the telephone, check their remote e-mail, and download a file from the Internet at the same time. And when they're ready for video broadcasting, teleconferencing and ATM-based services, ADSL lets you deliver. Only Ericsson provides turnkey solutions for your whole telecommunications network. Take a hint from Dorothy and get up to speed with ADSL. Call Ericsson today at 1-800-431-2345 or visit our website at www.ericsson.com/cobra. Before it's too late to get in the game.

ERICSSON

Circle 100

America's Network Contents

September 15, 1997 • Volume 101 • Number 18

COLUMNS

8 OBSERVATION DECK
Winning the WAN wars. ATM emerges as the wide-area network transport vehicle.
By Richard Kushner

10 WASHINGTON BRIEFING
Pocket change adds up. With new payphone rulings, quarters and dimes can translate into dollars. *By Susan Bahr*

70 LAST CALL
The FCC's silver lining. Court emphasizes agency's regulating power. *By Alan Pearce*

BROADBAND

12 KEEPING IN SYNC WITH SONET
How to manage Sonet networks using Synchronization Status Messages.
By Mike Green, G. Scott Henderson and Ed M. Underwood

24 IF IT'S BUILT IN, THERE'S A REASON FOR IT
Why carriers shouldn't switch off performance monitoring features provided in their Sonet muxing systems.
By Randy Eisenach

32 THE DANGERS OF INERTIA
Network, heal thyself, Part II: The sense of impending doom depends on whom you talk to.
By Arielle Emmett

54 BROADBAND NOTEBOOK

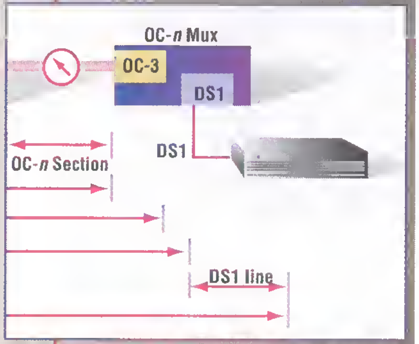
OUTSIDE PLANT

42 THE RIVER RAN THROUGH IT
When the 500-year flood hit Grand Forks, gel-filled jacks tolled loud and strong for U S West.
By Rick Muscoplat

48 RAM-ING THROUGH xDSL DEPLOYMENT
Architecture incorporating remote access muxes can give carriers plug-and-play capability.
By Sassan Babaie

54 OUTSIDE PLANT NOTEBOOK

4 From the Editors
5 In Box
56 Bitstream
58 New Products
68 Advertisers' Index
How to contact *America's Network*



Monitoring Sonet performance **Page 24**

The dangers of inertia **Page 32**

Gel-filled jacks perform **Page 42**

When the Sonet network's in sync, the result is pure harmony. Our thanks to Daniel Barenboim and the Chicago Symphony Orchestra for providing our cover image.

MARY SLEPICKA

Market specialists

A warm "Welcome!" to **Charles Mason** and **Shira Levine**, who have assumed Senior Editor posts on the *America's Network* team.

Charles has been a well-known telecom journalist since 1985. For more than a decade, he has served as Washington, D.C., and West Coast bureau chiefs of various industry publications, covering a wide range of issues, from government regulation, to mobile computing and new wireless technologies. He holds a Bachelor of Arts degree in Journalism from the University of Montana.

Charles becomes *AN's* Broadband editor, and assumes control of one of the most dynamic (and vast) sections of the magazine. Look for his upcoming analyses on broadband access, the market strength of cable modems and new transmission schemes, among other issues. Charles is based in Bothell, Wash., near Seattle.

Shira Levine has been covering telecom for nearly four years, where she has provided ongoing coverage of "new media" technologies, including cable modems, multimedia and Internet issues. She is a graduate of Amherst College in Massachusetts, and holds a Master of Science in Journalism from Northwestern University's Medill School of Journalism. Shira takes over our Services coverage, concentrating on network management, operational support systems, billing and customer care, and data warehousing, for example. Shira is based in our Chicago office at 312 W. Randolph St., Suite 600, Chicago IL 60606 (additional contact information for Charles and Shira is given at right).

The additions of Charles and Shira to our senior staff enable us to implement an editorial structure that may seem rather unique, but which has been evolving over the last year. Our tech-savvy senior editors function as "sub-editors" of *America's Network*. As market specialists, they have responsibility for coordinating coverage within their specific sections:

- Arielle Emmett now takes sole responsibility for Wireless issues;
- Annie Lindstrom handles Wireline and Outside Plant;
- David Kopf, our Web editor, also manages our Internet coverage;
- Charles Mason coordinates our Broadband section; and
- Shira Levine is the point editor for all Services-related issues.

The core editorial team at *America's Network* has more than 60 years combined in telecom journalism experience—giving us a perspective readers can rely on. Together with our supporting writers and editors, contributing writers, and Editorial Advisory Board members, we feel well-positioned as the premier provider of business-case analysis of networking trends and technologies. We hope you think so, too.

Mary Slepicka

America's Network

EDITORIAL OFFICES
201 Sandpointe Ave., Suite 600
Santa Ana CA 92707-8700
☎ 714/513-8400 Fax 714/513-8634
http://www.americasnetwork.com

Executive Editor	MARY SLEPICKA ☎ 714/ 513-8643 mslepicka@americasnetwork.com
Managing Editor and Web Editor (Internet)	DAVID KOPF ☎ 714/513-8459 dkopf@americasnetwork.com
Senior Editor (Wireline, Outside Plant)	ANNIE LINDSTROM *In New York* ☎ 212/951-6735 Fax: 212/683-4257 alindstrom@americasnetwork.com
Senior Editor (Wireless)	ARIELLE EMMETT *In Philadelphia* ☎ 610/447-0570 Fax: 610/876-5252 arielleem@aol.com
Senior Editor (Broadband)	CHARLES MASON *In Seattle* ☎ 714/513-8400 cmason@americasnetwork.com
Senior Editor (Services)	SHIRA LEVINE *In Chicago* ☎ 312/553-8900 Fax: 312/553-8926 slevine@americasnetwork.com
Associate Editor	DEBBIE SKLAR ☎ 714/513-8698 dsklar@americasnetwork.com
Art Director	JON FRAZE ☎ 714/513-8652 jfraze@americasnetwork.com
Publications Assistant	REBECCA ITTNER ☎ 714/513-8422 rittner@americasnetwork.com
Contributing Editor	ALAN STEWART 0007541340@mcimail.com
COLUMNISTS:	
Washington Briefing	SUSAN BAHR sbahr@aol.com
Market Engineering	FRANK BERNHARD fbernhard@advanstar.com
Last Call	ART BROTHERS ALAN PEARCE
CONTRIBUTING WRITERS:	JOHN MADRID THOMAS NOLLE JOHN PESCATORE

EDITORIAL ADVISORY BOARD

SANJIV AHUJA (Bellcore)
MEHMET BALOS (Ericsson Network Systems)
GEORGE EDWARDS (ATIS)
DAVID KELLEY (MEANS Inc.)
GEORGE MAKHOUL (Price Waterhouse)
MANOJ SAXENA (3M Telecom Systems)
ROBERT SELLINGER (Lucent Technologies)
LORENE STEFFES (Ameritech)
ROBERT STOFFELS (NECA)
THOMAS SUPER (Nynex Science & Technology)

BUSINESS STAFF *(see also page 68)*

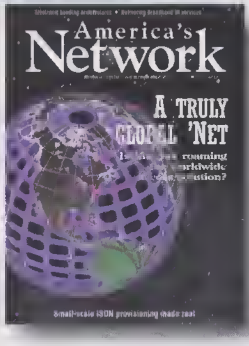
Publisher	PAUL SEMPLE
General Manager	DANNY PHILLIPS
Senior Publisher	RAY SMITH
Business Manager	COLETTE O'DONNELL
Production Director	MIKE WELDON
Production Manager	JULIE KOERBER
Circulation Manager	HENRY FUNG
Promotion Director	SUSAN DOBAK
International Licensing	TAMMY LILLO

ADVANSTAR
COMMUNICATIONS

Chairman & CEO	ROBERT L. KRAKOFF
Vice Chairman	JAMES M. ALIC
V.P.-Business Development	SKIP FARBER
V.P.-Strategic Planning	EMMA T. LEWIS
Executive Vice Presidents	KEVIN J. CONDON, ALEXANDER S. DEBARR, BRIAN LANGILLE, GLENN A. ROGERS
V.P.-Finance; CFO; Secretary	DAVID W. MONTGOMERY
Treasurer & Controller	ADELE D. HARTWICK

America's Network evaluates emerging technologies, from a business-case perspective, for those who conceive, design and run America's public network. It is written for those responsible for design, deployment, operation and maintenance of public network elements. Readership includes local and long distance telephone companies, CATV companies, competitive access providers, wireless network operators, resellers, computer companies, and telecommunications industry suppliers and consultants.

ELECTRONIC BONDING



I enjoyed your July 1 article on electronic-bonding gateways, but need to bring an oversight to your attention.

Table 1 of that article (July 1, page 21) associates [electronic-bonding application] Billing with the Ordering and Billing Forum standards. The article also should have associated billing standards with the work performed by the Telephone Bill Work Group (TBWG).

The TBWG was organized in August 1988 as a subcommittee of the Electronic Data Interchange (EDI) Committee within the Telecommunications Industry Forum (TCIF) under the auspices of the Alliance for Telecommunciations Industry Solutions [ATIS; formerly the Exchange Carrier Standards Association].

TBWG is comprised of representatives from many telecommunications companies and their customers. The work group originated and continues development of the EDI ANSI [American National Standards Institute] ASC X.12 811 Transaction Set. Participants work together to standardize the use of the Consolidated Services Invoice/Statement in the telecommunications industry, and have recently completed Issue 7 of our Customer Services Implementation Guidelines.

If readers have any questions regarding the work of the TBWG, they can access our World Wide Web page at www.atis.org/atis/tcif/edi/tbwg/5tc54hom.htm.

Pat Monaghan
GTE Telephone Operations
Chair-Telephone Bill Work Group

Looking for information on ADSL deployment, next-generation wireless applications, or object-riented computing?

Look it up at *www.americasnetwork.com*

Have something to **SAY?**

Send your comments to Editor, *America's Network*, 201 Sandpointe Ave., Suite 600, Santa Ana, CA 92707; fax 714/513-8634 or e-mail to editors@americasnetwork.com. Comments may be edited for clarity and length.

Underground Warning Tape
Continuous protection for your utility lines.

8 MATERIAL TYPES

Extra Stretch® 540 is specifically engineered to provide superior elongation while maintaining both high tensile strength and high puncture resistance for maximum protection against accidental service interruptions.

Standard 250 is an economical alternative for less strenuous site conditions and is available in 2, 3, 4, and 6 mil thicknesses.

Extra Strength is a non-stretch, woven product which provides high puncture resistance and tensile strength.

Sentry-Line® is available in standard and reinforced grades, both of which can be located prior to digging through the use of a variety of pipe/cable locators.

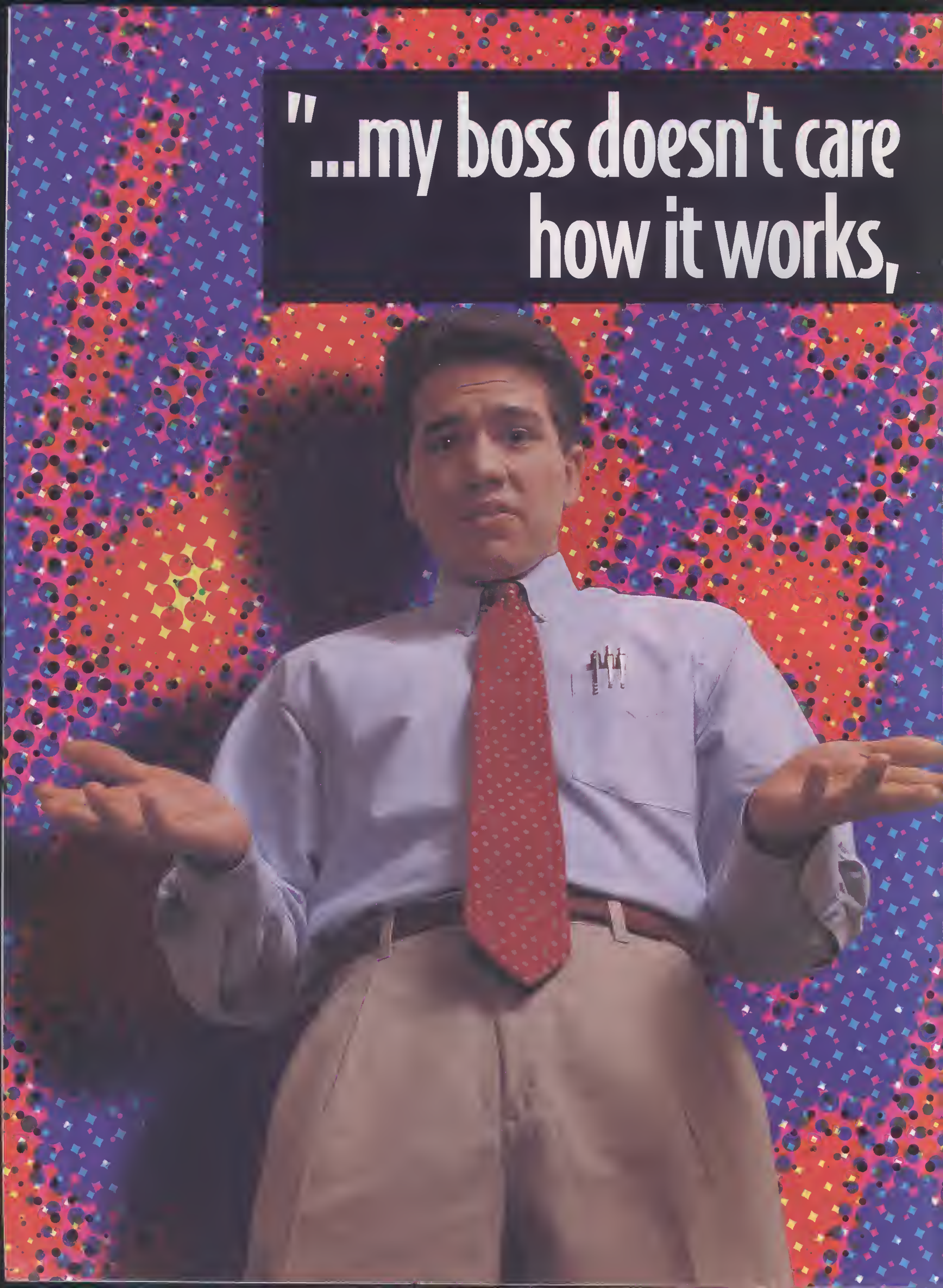
- All Terra Tape products can be custom imprinted with your company name, logo, phone number.
- Additional options include plastic cores, dispenser reels with handles, dispenser boxes, imprint coatings and end of roll indicators.
- Stock imprints available for immediate shipment.
- Printing remains legible and material color remains true even after being buried for many years.
- EDI capable.

U.S (800) 231-2417
Collect (713) 507-4200
FAX (713) 507-4295
Canada (800) 847-5616
www.reefindustries.com

TerraTape®
Superior Cable Protection.
Reef Industries, Inc. P.O. Box 750245
Houston, Texas 77275-0245

® 1996 Reef Industries, Inc. Terra Tape, Extra Stretch and Sentry-line are registered trademarks of Reef Industries, Inc.

Circle # 101


"...my boss doesn't care
how it works,

it just has to work!"

Why chance it? Fujitsu is synonymous with SONET solutions.

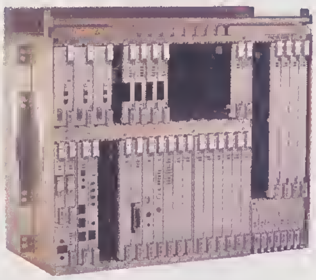
Need a savvy resource for broadband help? Fujitsu has it all. Equipment. Management systems. And most important — answers, guidance and support from the undisputed leader in SONET technology. In fact, at this writing there are over 5,000 Fujitsu SONET rings deployed in the U.S. alone. All of them flexible. Reliable. Easily upgradeable. And designed to handle whatever opportunities come along.

OSI...Oh So Important.

From the operations center to the customer premises, Fujitsu's SONET equipment will be the first to offer fully compliant OSI 7-layer network management visibility, connectivity, monitoring and status messaging. Finally you'll be able to take advantage of features like software-downloadable product enhancements and remote memory back-up for network restoration. Plus, there's easy migration to future applications.

Future-proof with our FACTR® platform.

The allure of broadband is the breadth of upcoming service offerings — LAN interconnection, cell relay, video-on-demand. But now, with our FACTR access/transport platform, you can future-proof your network and wring additional sales out of existing narrowband pipes. For instance, with the FACTR platform you can plug everything into your broadband backbone and offer SONET survivability all the way down to DS0-based services. With one fell swoop, you can position your network for future demands using a platform that starts paying-off sooner, rather than later.



The FACTR® platform supports broadband and narrowband services from a single mechanical package.

Call on Fujitsu Network Communications* – ASAP.

We can help you build a cost-effective fiber network. One that works like it should. One that offers a graceful migration. One that will help keep you (and the boss) happy. The hardware and software are available. The expertise is available. All you have to do is call 1-800-777-FAST or e-mail us: fast@msmail.fnts.com.

*The formation of Fujitsu Network Communications, Inc. will be completed in mid-1996.

FUJITSU

Circle 102

RICHARD KUSHNER

Winning the WAN wars

ATM emerges as the WAN transport vehicle.

It's high time that corporate network planners come to the realization that supporting extended organizations is becoming what their jobs are all about. Gone are the days of LAN-centric strategies, limited in scope to a company's MIS department. The 80/20 traffic pattern rule no longer applies. Thanks to the Internet, intranets, collaborative software, etc., it's likely that 80% of any application-generated traffic will head out of a local area network, to be shared with other members of a dispersed community of interest. Most of an organization's traffic is destined to traverse the wide area network (WAN).

Only an ATM-based LAN or campus backbone can seamlessly integrate with ATM core platforms deployed by the service providers.

Corporate network planners must consider how they can best integrate their own infrastructure to that of their carriers'. At the same time, savvy service provider strategists will be planning how to leverage new service opportunities created in this increasingly WAN-centric networking paradigm.This phenomenon is called *extended enterprise networking*, which refers to the hazy division between LAN and WAN, as well as to the dynamic boundaries of enterprise networks—the constant expanding and contracting of access to an organization's vital information. Network parameters are more fluid than ever before. Because of this demand to "extend," organizations must rely more on public network services.

This is where synergy with the WAN becomes vital. Ever since the inception of LAN data transport, the LAN/WAN demarc has been a bottleneck. Dissimilar transport protocols, media differences (connectionless *vs.* connection-oriented, shared *vs.* switched), conversion and encapsulation routines, and bandwidth mismatches have conspired to limit the effectiveness of enterprise-wide network applications. The result? Expensive, inefficient and multiple-overlay networks operated by service providers to patch together sub-optimal enterprise service delivery offerings for their customers.

ATM AT THE CORE

True enterprise-enabling looms on the horizon. With unmistakable momentum, service providers are building out their infrastructures with asynchronous transfer mode (ATM) switching over Sonet transport at the core. This permits carriers to consolidate multiple legacy services onto a single platform—at dramatic cost savings. While ATM-bearing services remain a small industry (less than $100 million in revenues in 1995-96), telcos spent over $800 million on ATM equipment in that same period. ATM core transport has won the war in the WAN.

Acknowledging this fact—and accepting that, in today's "extended enterprise" world, a service provider's architecture is a critical component of an organization's network—corporate planners must ask two questions:

- "What should the core of *my* network be?"
- "Do I want to perpetuate the historic LAN/WAN transport duality—the demarc bottleneck?"

Logic dictates that only an ATM-based LAN or campus backbone can seamlessly integrate with ATM core platforms deployed by service providers. While IP-based traffic will be switched to the desktop for years to come, it defies logic to assume that carriers will undertake mass buildout of Gigabit Ethernet in their cores anytime soon.

While carriers may not yet offer ubiquitous ATM-bearing services, their capital investment in ATM switching makes it only a matter of time until the majority of carrier POPs offer ATM access. Then, the opportunity to leverage a common ATM infrastructure—across the public WAN core and the premises LAN backbone—will become reality.

For the service provider, new and effective managed services are attractive: transparent LAN service, multiapplication integrated services, per-byte billing capability, etc. A common ATM transport core across the enterprise network means more flexibility, improved management and administration, and reduced costs with improved performance.

Decisions made today on the choice of a core network platform will have ramifications for years to come.

With ATM emerging as the WAN service platform of tomorrow, the opportunity to position LAN/campus architectures for seamless integration with the WAN is finally open. Network planners must extend their network applications—hey, make it ATM at the core! After all, this ain't your father's enterprise. ■

Richard Kushner is senior marketing manager-service provider channels for Fore Systems Inc. (Warrendale, Pa.)

Imagine the next giant leap in local loop access.
We have.

Imagine the local loop access system of the future. One that delivers broadband and narrow band services; supports TDM, Frame Relay and ATM networks; and uses any network infrastructure.

Sound good? We're shipping it.

Introducing the world's first 3rd Generation Digital Loop Carrier: the UMC 1000™ from Advanced Fibre Communications.®

The UMC 1000™ 3GDLC has the bandwidth – 6.2 Gbps – to economically support from 1 to over 2000 lines, delivering 64 Kbps to 155 Mbps of voice or data access to any subscriber over TDM, Frame Relay and ATM networks.

These features push the capabilities of the UMC 1000™ far beyond those of traditional Digital Loop Carrier (DLC) and Next Generation Digital Loop Carrier (NGDLC) solutions.

AFC has set the new price/performance standard for local loop access systems – providing the bandwidth for a new generation of applications.

Advanced Fibre Communications.
Any network. Any transport. Any service.™

AFC
ADVANCED FIBRE COMMUNICATIONS

Petaluma, CA ■ (707) 794-7700 ■ www.fibre.com

© 1997 Advanced Fibre Communications, Inc. All rights reserved. UMC 1000 is a trademark and Advanced Fibre Communications, AFC, and the AFC logo are registered trademarks of Advanced Fibre Communications, Inc.

Circle 103

SUSAN BAHR

Pocket change adds up

Quarters and dimes may translate into dollars.

This year marks a milestone in payphone history. Last fall, the Federal Communications Commission (FCC) raised the fixed monthly amount that interexchange carriers (IXCs) compensate payphone providers for non-coin calls (such as 10XXX dial-around calls) by $39 per phone. Previous compensation was $6 per month per phone; now, it's more than $45 per month, per phone. For a payphone provider with 100 phones, that's an increase of more than $3,900 in monthly revenue.

Higher payphone revenues means more payphone providers, and a greater need for support services.

The FCC has ordered local coin rates to be deregulated by Oct. 7. Coin rates for local calls may increase, and some payphone operators may receive even higher monthly compensation from IXCs. Higher payphone revenues may attract new players into the payphone business—players who will need network and other support services.

Previously, the coin rate for local payphone calls was $0.10 to $0.35 in regulated states and $0.35 in most deregulated states. Industry insiders bet that, after Oct. 7, local coin rates across the country will be $0.35—or more. Pocket change adds up: Consider a payphone on which 800 local coin calls are made each month. If the local call rate is $0.25 and will be $0.35 in October, and assuming that 25% of callers will deposit two quarters rather than $0.35 even, that phone will receive an additional $110 per month. If the provider owns 100 phones like that one, it pockets $11,000 per month in extra revenue.

EASY COME, EASY GO

It's tempting, but presumptive, to add the $11,000 increase in coin revenues to the $3,900 increase in compensation. On Oct. 7, the fixed monthly compensation rate will become a per-call rate of about $0.25 or $0.35, depending on contractual arrangements and upcoming FCC rule revisions. Some phones won't receive any compensation, because they have no "compensable calls," such as dial-around calls. Those phones will lose the $45 per month they now receive. Yet, other phones with heavy dial-around use, such as in airports, may receive hundreds of dollars per month.

The number of calls eligible for compensation may rise due to the increasing popularity of prepaid cards. But prepaid card calls may displace operator-assisted calls. Payphone providers that receive operator service commissions for 0+ calls could end up with lower 0+ commissions.

Payphone providers often pay commissions to the owners of the premises where the payphones are located. Higher revenues may mean higher commissions. A provider that pays $60 per month to a local convenience store may need to increase that monthly payment, depending on its contract with the store owner.

While the FCC rule changes may benefit payphone operators, local exchange carriers (LECs) may profit by providing services to non-LEC payphone providers. More payphone providers may mean more network services will be needed to support those payphones. Basic services and features, such as answer supervision, could be provided to them on an unbundled basis. More payphones also means more maintenance and coin collection. Investors could purchase payphones and outsource support services to the LECs.

THE CONSUMER REACTION

The impact on use is the big unknown. Will per-phone use decrease if the number of payphones increases? What will consumers do when they don't have enough change for a $0.35 call—will they not make the call or will they use a calling card? As Shakespeare said in *Henry IV*: *So far as my coin would stretch; and where it would not, I have used my credit.*

Consumers may pay more for local coin calls, depending on the payphone's location. Consumers also may pay more for calling card, collect and credit card calls if long distance companies raise their prices (as AT&T did in May) to offset the payphone compensation they're paying. However, consumers could end up paying less for the network services that previously subsidized telco payphone service.

Payphone service providers, premises owners and LECs may benefit from increased payphone rates, heightened competition and increased need for network and other support services. The three keys to payphone success will remain: *location, location, location.* ■

Susan Bahr is a telecommunications attorney with Blooston, Mordkofsky, Jackson & Dickens in Washington, D.C. (sbahr@aol.com). Article does not consitute legal advice; those seeking legal advice for specific situations should obtain the direct counsel of an attorney.

We've done for loop testing what the pocket watch did for telling time.

Introducing the new 3M™ Dynatel™ 965DSP Subscriber Loop Analyzer. Like the pocket watch, it is small and revolutionary, making OSP loop testing jobs easier, faster, and more accurate than ever.

Combining a capacitance bridge, resistance bridge and Time Domain Reflectometer (TDR), the Dynatel 965DSP subscriber loop analyzer enables complete POTS testing functions, as well as fundamental ISDN/HDSL testing. The backlit, high-resolution/high-contrast LCD screen displays results in user-friendly graphic icons, enabling quick and easy data interpretation. A built-in HELP function eliminates the need for manuals. The unit even offers multi-language capabilities — all in one lightweight, hand-held package.

By combining the functions of multiple test sets in one easy-to-use unit, the 965DSP subscriber loop analyzer is your total maintenance test solution. So when you have an outside plant maintenance job requiring speed, accuracy, and reliability, the Dynatel 965DSP subscriber loop analyzer puts everything you need right in the palm of your hand.

To learn more, contact your 3M representative, or call 3M Telecom Systems Division at 800 745 7459 or fax 512 984 5811. Visit our web site at www.mmm.com/telecom

Visit us at ICUEE in Booth 1507.

Circle 104

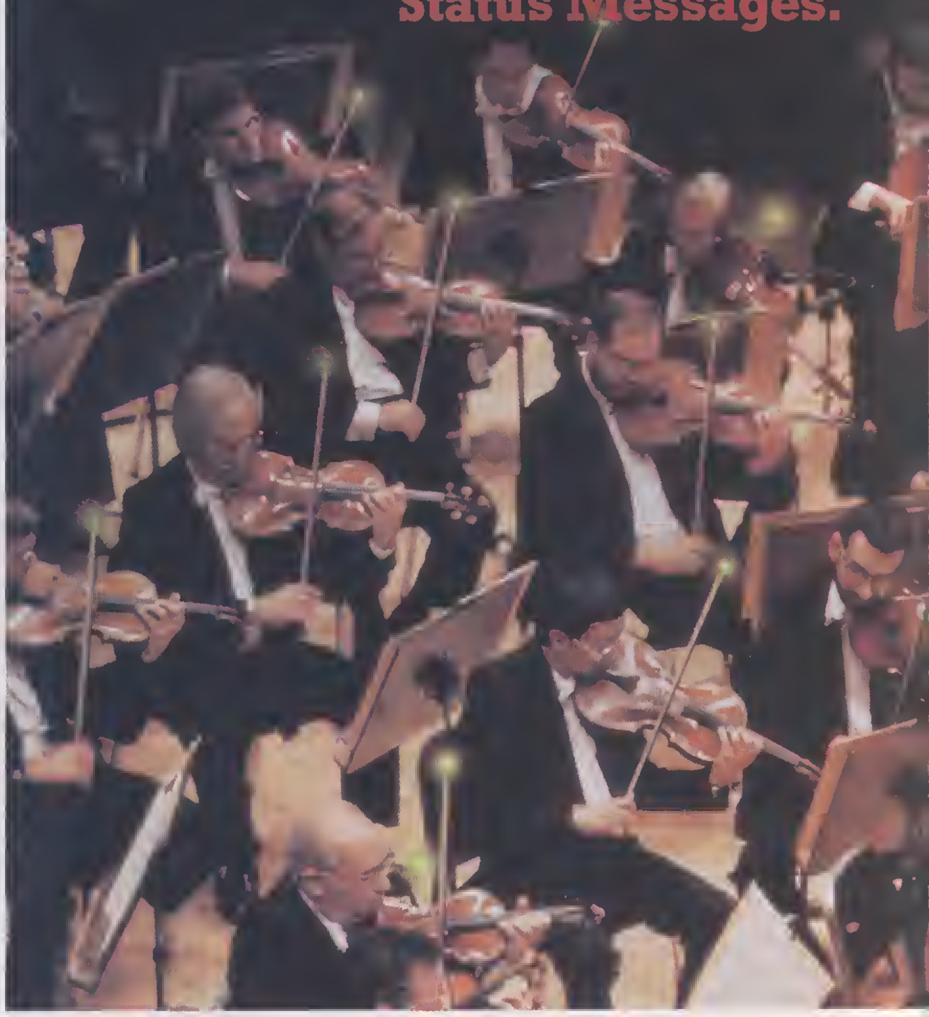
3M Telecommunications

BROADBAND

MIKE GREEN, G. SCOTT HENDERSON, ED M. UNDERWOOD

Keeping in sync with Sonet

How to manage Sonet networks using Synchronization Status Messages.



SYNCHRONOUS OPTICAL NETWORK (SONET) TECHNOLOGY HAS BECOME THE OVERWHELMING CHOICE FOR INTEROFFICE TRANSMISSION SYSTEMS. STANDARDIZED SONET TECHNOLOGY SUPPORTS NEW, FLEXIBLE, TRANSPORT NETWORK ARCHITECTURES WITH WELL-DEFINED GROWTH CAPABILITIES, AND OFFERS NETWORK OPERATORS BETTER MAINTENANCE AND MANAGEMENT FUNCTIONALITY THAN PREVIOUS TECHNOLOGIES—ALL IN A COST-EFFECTIVE MANNER FOR AN EVER-EXPANDING TRAFFIC ENVIRONMENT.

The format of Sonet optical carrier (OC-*n*) signals is based on a frame rate of 8,000 frames per second. The OC-1 frame is organized as a 9 byte x 90 byte matrix, which gives a bit rate of 51.84 Mbps; therefore, each byte of the matrix represents a capacity of 64 kbps, or a single DS0 channel. In the OC-1 frame, each byte is designated as payload transport or overhead capacity, depending on its position in the matrix. The OC-*n* signal consists of *n* OC-1 frames, aligned and interleaved sequentially, one byte at a time, from each of the *n* frames (where *n* can take the value of 1, 3, 12, 48 or 192).

The 8 kHz fundamental rate underlying the Sonet format was chosen to coincide with the 8,000 frames per second of the DS0 and DS1 signals. DS0 and DS1 signals are the basic building blocks of all digital switching/routing elements and transport facilities; 8,000 samples per second was originally defined for digitization of voice channels.

With a common (8 kHz-based) *m* x 8 kHz clock source (in which *m* is an integer or set of integers suitable for the specified signals) for all interconnected Sonet systems, different types of traffic (in the form of payload bytes) can be dropped, inserted or cross-connected virtually error-free and with low delay.

Photo courtesy of the Chicago Symphony Orchestra

This functionality, together with such new architectures as bidirectional rings, gives Sonet technology its flexibility and adaptability.

SYNCHRONIZATION DISTRIBUTION

The process of ensuring that all Sonet network elements (NEs) and their output optical signals are timed from the same 8 kHz-based clock source is referred to as *synchronization distribution*. Regardless of the transport network architecture, timing distribution in rings and fully-connected meshes, for example, must be considered as an overlay of linear paths to each NE from a master clock—that is, as a tree structure.

Having a large network rely on a single master clock is impractical, and has been abandoned. Instead, many master clock sources are used, each with sufficiently high accuracy—indeed, frequency differences between them are so small that any traffic degradation would be negligible. These clocks are referred to as *Stratum 1 sources*, and are available in cost-effective models based on Global Positioning System (GPS) technology. Cesium-beam Stratum 1 sources are available for locations where GPS cannot be used.

> **Many master clock sources are used, each with sufficiently high accuracy so that any traffic degradation is negligible.**

Each location or office with a Stratum 1 clock has other locations subtended from it, in a timing distribution sense. A lesser quality local master clock or Building Integrated Timing Supply (BITS) normally tracks the frequency of one of a designated set of OC-*n* signals from the Stratum 1 location. The BITS function is typically performed by a timing signal generator (TSG).

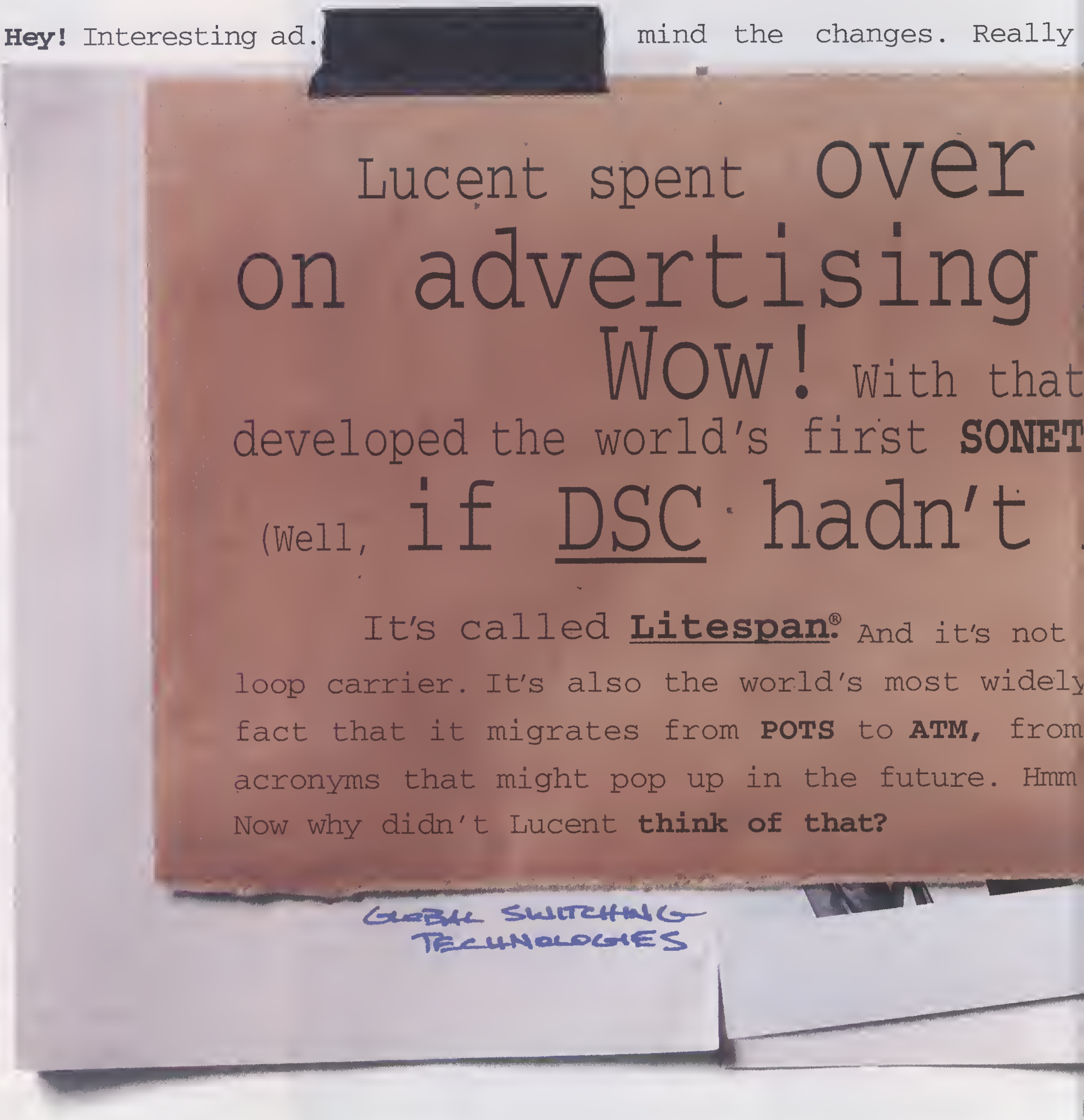
Clock quality is defined by several parameters, such as filtering capability, transient suppression and holdover accuracy during loss of Stratum 1 connection. These subtended, or 'slave,' clocks form a quality hierarchy and are referred to as Stratum 2, 3E and 3. In normal situations (in which no network failures occur), every slave clock in the network is synchronized, or traceable, to a Stratum 1 clock. Each has at least two potential reference inputs, typically prioritized as Primary and Secondary. The TSG must select from a set of designated inputs based on acceptability of incoming signals and priorities assigned by the synchronization distribution network planner.

The planner also can define the algorithm for the selection process, to a limited extent.

A similar process is replicated at each Sonet network element co-located with the TSG. Usually, there is a pair of DS1 signals of equal priority from the TSG to each NE; however, in some operating

continued on page 16

Hey! Interesting ad. [redacted] mind the changes. Really



Lucent spent over

on advertising

Wow! With that

developed the world's first **SONET**

(Well, if DSC hadn't

It's called **Litespan**® And it's not

loop carrier. It's also the world's most widely

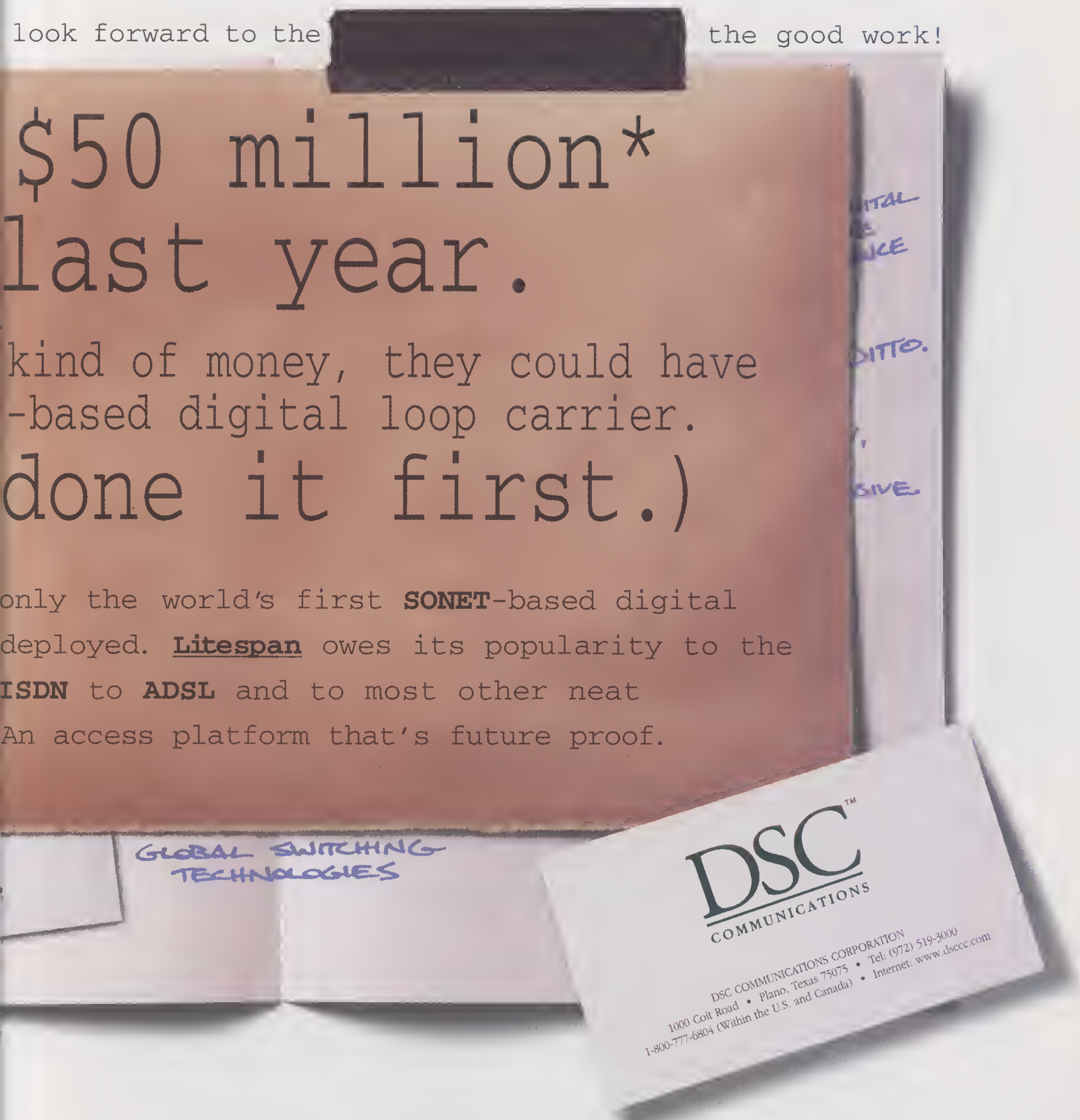
fact that it migrates from **POTS** to **ATM,** from

acronyms that might pop up in the future. Hmm

Now why didn't Lucent **think of that?**

GLOBAL SWITCHING
TECHNOLOGIES

DSC Communications Corporate Headquarters: 1000 Coit Road • Plano, Texas 75075
Sales Locations: Australia • Belgium • Brazil • Canada • Denmark • France • German
Philippines • Poland • Puerto Rico • Russia • Singapore • Taiwan • United Kingdom • US
Lucent is a trademark of Lucent Technologies, which is not affiliated with DSC
Corporation. *Source: *Advertising Age*, June 2, 1997.



look forward to the the good work!

$50 million*

last year.

kind of money, they could have

-based digital loop carrier.

done it first.)

only the world's first **SONET**-based digital

deployed. **Litespan** owes its popularity to the

ISDN to **ADSL** and to most other neat

An access platform that's future proof.

DSC COMMUNICATIONS CORPORATION
1000 Coit Road • Plano, Texas 75075 • Tel: (972) 519-3000
1-800-777-6804 (Within the U.S. and Canada) • Internet: www.dsccc.com

The Power To Do More.℠ And More. And More.

(Breakthrough Technology. Not Advertising.℠)

(972) 519-3000 • 1-800-777-6804 (Within the US and Canada) • http://www.dsccc.com
• Hong Kong • Hungary • India • Italy • Japan • Korea • Lithuania • Malaysia • Mexico
• DSC and the DSC Communications logo are trademarks of DSC Communications Corporation.
Communications Corporation. Litespan is a registered trademark of DSC Communications

Circle 105

continued from page 13

environments, the NE also may be able to perform line-timing, in which timing is extracted from one or more received OC-n signals. NEs such as this require a different timing reference selection algorithm.

Allowing a network element to switch between external (TSG) timing and line-timing modes can be risky, and requires more "intelligent" planning and management of the synchronization distribution network.

The aim of the synchronization distribution network—the "Stratum 1 traceability" condition of each Sonet NE—cannot be guaranteed in a real-world network, which has many mechanisms that can add phase noise or cause failures in a timing path from the Stratum 1 to all Sonet NEs.

Even though synchronization distribution planning follows conservative design rules for maximum robustness, there is a small, but finite, probability that a timing fault will occur and a slip buffer in the DS1 case (or pointer buffer in the Sonet payload) will overflow or underflow.

The effects of inaccurate timing are seen as *controlled slips* on DS1 signals, or *jitter* or *wander* on Sonet payloads. The result is a repetition or loss of a single byte of each constituent DS0 in the DS1. Degradation caused by controlled slips on DS0 signals depends on the type of traffic, which can range from minimal annoyance in 64 kbps pulse code modulation (PCM) voice to an unacceptable loss of throughput for applications using high bit-efficiency schemes, such as compressed or highly processed video signals.

Excess jitter causes bit errors, which may be significant, depending on the error-handling processes of an application. Wander may accumulate in a DS1 terminal receiver buffer and cause a controlled slip.

One notable aspect of timing faults is that inaccurate timing at a given location (or network element) may degrade a payload recognized at a different site—that is, in the NE which terminates the payload. Because of the statistical nature of the buffer spill mechanism, a certain NE timing fault condition will not have the same effect on all signals transmitted from or terminated by that network element. Thus, isolating a soft failure in the synchronization distribution network is not a straightforward activity.

The Stratum 1 traceability condition of each Sonet NE cannot be guaranteed in a real-world network, which has many mechanisms that can add phase noise or cause failures in a timing path from the Stratum 1 to all Sonet NEs.

TIMING LOOPS

The worst-case scenario is a condition known as a timing loop. Here, the active timing reference for a TSG or NE is traceable to the output of that same TSG or NE. In a complex network, the path from output back to input may be difficult to identify. Moreover, because of the conservative margins built into networks and network elements, slave clocks in the feedback chain may operate in a stable state with accuracy rates close to the desired rates. Stratum 1 accuracy. Eventually, however, a phase transient occurrence will cause positive feedback, and a frequency error will rapidly build up.

Glossary of terms and abbreviations used in this article

Sonet	Synchronous Optical Network
kHz	kilohertz
NE	network element
GPS	Global Positioning System
BITS	Building Integrated Timing Supply
TSG	timing signal generator
OC	optical carrier
DS0	digital signal
PCM	pulse code modulation
SSM	Synchronization Status Message
SMC	Sonet Minimum Clock
DUS	"Don't Use for Sync" message
STU	"Stratum Traceability Unknown" message
RES	"REServed for Network Synchronization" message
ADM	add/drop multiplexer
ESF	Extended Superframe Format
PRS	primary reference source
ANSI	American National Standards Institute

The most dangerous feature of the timing loop is that, when it occurs, all of the TSGs and NEs in the loop path appear to remain in a normal tracking mode, and no alarms are raised. Only service degradation, detected by a customer's application, will give notice that non-ideal behavior is occurring.

Prevention is the best strategy for avoiding timing loops. This only can be achieved if the synchronization distribution planner:

- Fully understands his network;
- Carefully considers all possible combinations of timing distribution failures and restoration processes; and
- Accurately provisions all TSG and NE synchronization aspects.

As the network evolves, the synchronization distribution plan must be updated regularly.

ENHANCED MANAGEMENT/ MAINTENANCE

Competition, and the need for high credibility and demonstrability of timing performance (among other parameters) at strategic carrier interconnection interfaces, has extended the traditional goal of high performance with high availability.

Now, the industry is driven to provide performance past the level required by formal standards.

One of the many features supporting enhanced management and maintenance by the overhead bytes of the Sonet format is the Synchronization Status Message (SSM). SSM uses four bits of the OC-*n*'s S1-byte to indicate the acceptability status and quality level of the OC-*n* signal, as determined

SINGLE PLATFORM. DOUBLE CAPACITY. TRIPLE OPTION.

ADC HOMEWORX™ TRANSPORT SYSTEM. THE ONLY FULLY INTEGRATED HFC PLATFORM FOR VOICE, DATA AND VIDEO.

Building the broadband delivery system that will enable you to compete aggressively into the next century requires three things: *flexibility* to invest and adapt to changing market demands, *high capacity* to make the most efficient use of available spectrum, and *integration* to handle and manage multiple services over a single platform. You'll find all these and more in the ADC Homeworx HFC Access Platform.

Using OFDM modulation, Homeworx effectively *doubles* the available capacity (up to 240 DS0s per 6 MHz) over QPSK methods. This added efficiency allows both telephony and high-speed Internet data services to be provided using the same equipment and 6 Mhz spectrum. The modular Homeworx architecture provides "pay as you go" migratability from standalone telephony, data or video to fully integrated broadband services. And comprehensive network management ties it altogether.

So for flexible, efficient broadband service delivery of voice, data and video, the answer is as easy as ADC. Call us for more details at **800 366-3891.**

Circle 106

ADC Telecommunications®

WWW.ADC.COM

Provisionable messages provide the SSM with flexibility to support all Sonet architectures by automatically switching to an alternative reference should the active reference fail.

Figure 1A: The problem without Sync Status Messages

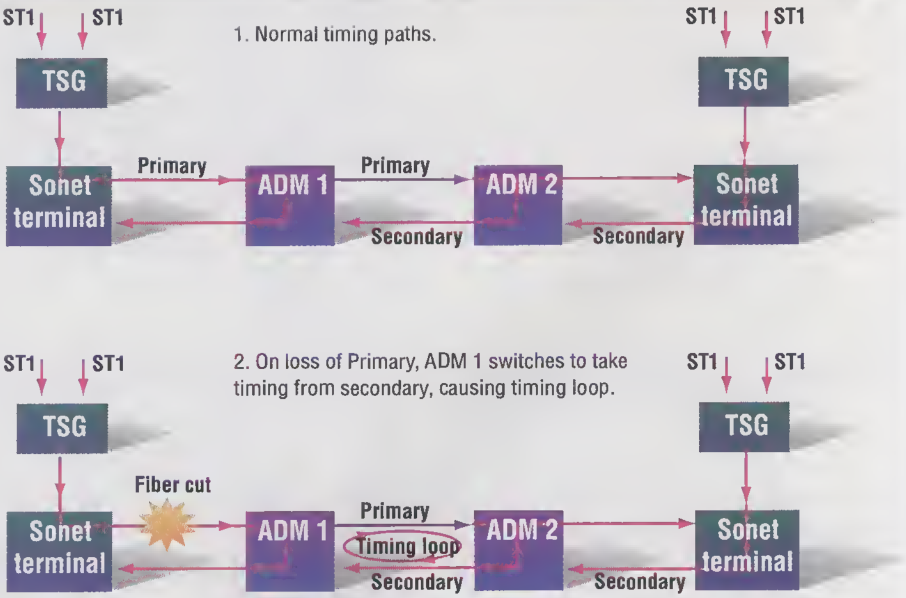
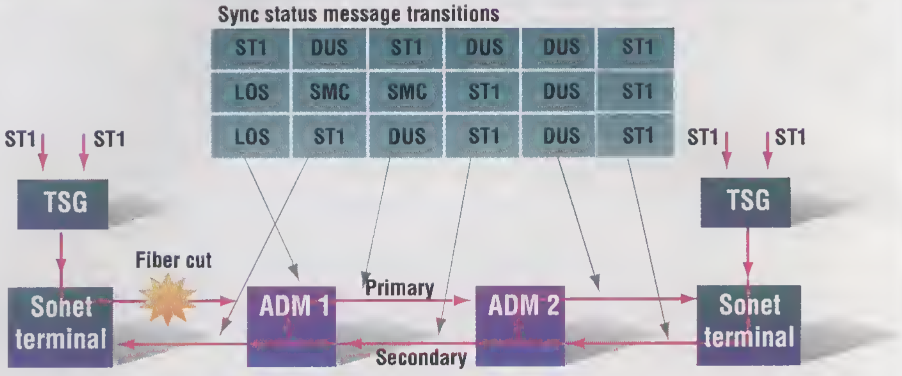


Figure 1B: The solution with Sync Status Messages



ST1	DUS	ST1	DUS	DUS	ST1
LOS	SMC	SMC	ST1	DUS	ST1
LOS	ST1	DUS	ST1	DUS	ST1

ADMs have internal Sonet Minimum Clocks

by the controlling clock or provisioning from the synchronization distribution planner. The controlling clock is the source clock at the apex of the chain of slaved clocks; it supplies reference timing to the NE generating the OC-*n*. Under fault-free conditions, the controlling clock is a Stratum 1 clock by design.

Other potential values for the SSM state are Stratum 2 and 3, and Sonet Minimum Clock (SMC; the base-line clock required for Sonet NEs). Other states not related to clock quality, but necessary for effective SSM operation, are described as:

- "Don't Use for Sync" (DUS); and
- "Stratum Traceability Unknown" (STU).

A user-assigned message for undefined clocks, the RES ("REServed for network synchronization") message, is also available.

Provisionable messages have specific applications. They provide the SSM with flexibility to support all Sonet architectures by automatically switching to an alternative reference should the active reference fail.

Provisionable messages can also accommodate evolving networks that are only partially equipped with SSM capability, and can guard against unintentional timing loops in bidirectional rings and linear add/drop multiplexer (ADM) systems.

The DUS message is normally inserted into an OC-*n* signal forming the return path from a downstream (slaved) network element to the upstream (source) NE in a bidirectional string of ADMs. This is a popular architecture, because the two separate full-duplex optical paths give robust, survivable traffic transport.

The RES message gives network operators the flexibility to use other stratum-level clocks in the TSG, such as the Stratum 3E, which was in proposal stage when the American National Standards Institute group T1X1.3 was defining SSM. The group did not formally accept Stratum 3E until later.

The STU message reflects the evolving nature of the typical network and carriers' desire for backward compatibility between new and existing structures. The four bits in the S1-byte that denote the STU message are defined as "0000", or the null set. Thus, an OC-*n* signal received from a NE that is not SSM-capable and whose unused bits are set to zeroes can be accommodated at a receiving NE which is SSM-capable, because the OC-*n* will have a compatible SSM interpretation assigned to it. This is effective, because the reference selection algorithm of the slave clock assumes that an STU message denotes that this OC-*n* is normally at Stratum 1 traceability, and gives it a preference weighting second only to an OC-*n* which has an SSM of Stratum 1.

The STU message is useful in situations where some (but not all) NEs have been upgraded to SSM, allowing graceful rollout of SSM capability into an existing Sonet system.

For intraoffice TSG-to-NE synchro-

ETHERNET & SONET-*TOGETHER AT LAST!*

WANT TO DELIVER
ETHERNET, DSI & DS3 OVER
YOUR SONET ACCESS NETWORKS?

CALL POSITRON.

DISCOVER
OSIRIS™
THE *UNIQUE* OC3
MULTIPLEXER
WITH INTEGRATED ETHERNET
FOR LAN TO LAN
AND
INTERNET APPLICATIONS.

- **OSIRIS** MAKES ETHERNET ***AS EASY TO PROVISION AS*** DSI. NO COMPLEX ROUTER TABLES TO LEARN AND MANAGE.
- **OSIRIS** MAKES ETHERNET ***AS RESILIENT AS*** DSI. NO BRIDGES, ROUTERS AND CSU'S TO PROVIDE AND MAINTAIN, PLUS **OSIRIS** GIVES YOU FULL PATH AND EQUIPMENT PROTECTION FOR LAN TRAFFIC.
- **OSIRIS** MAKES ETHERNET ***AS EASY TO MANAGE AS*** DSI. NO NEED FOR EXTERNAL MANAGEMENT SOLUTIONS.

OSIRIS™ PUTS THE FUTURE OF BROADBAND FIBER NETWORKS INTO YOUR HANDS.

FIND OUT MORE →

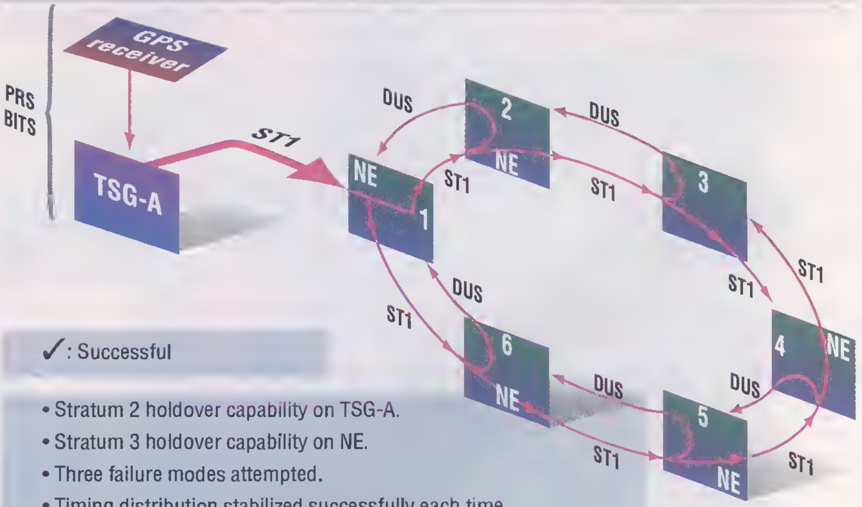
POSITRON
FIBER SYSTEMS

Positron Fiber Systems, Inc.
3000 Atrium Way, Suite 510 South, Mt. Laurel, New Jersey, 08054 **Phone: (609) 222-1288** Fax: (609) 222-1744

Circle 107

The STU message is useful in situations where some NEs have been upgraded to SSM, allowing graceful SSM rollout.

Figure 2A: **Topology 1: Single primary reference source**

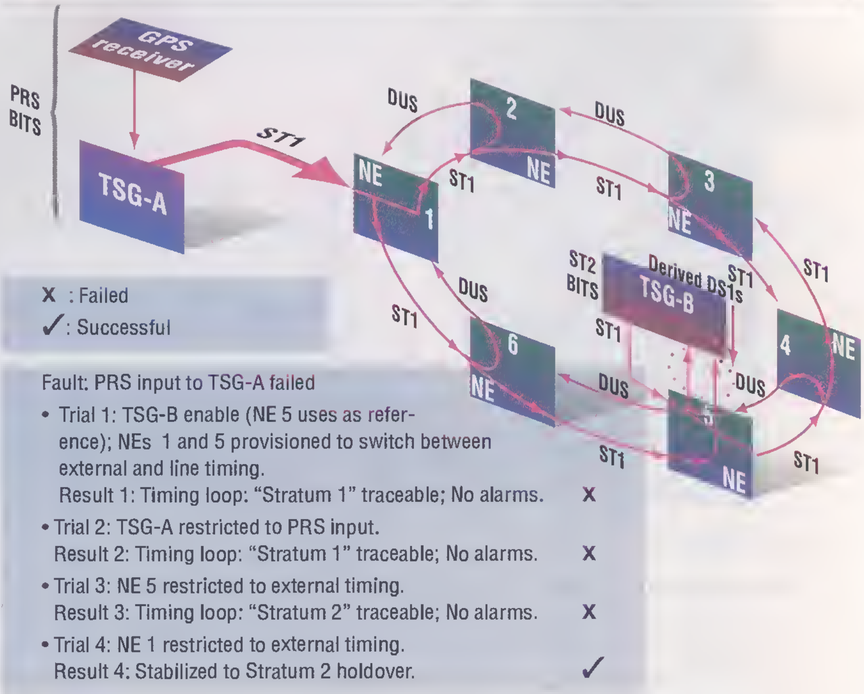


✓: Successful

- Stratum 2 holdover capability on TSG-A.
- Stratum 3 holdover capability on NE.
- Three failure modes attempted.
- Timing distribution stabilized successfully each time.

Fault A: PRS input to TSG-A failed.
Result: Stabilized to ST2 holdover. ✓
Fault B: TSG-A failed.
Result: Stabilized to ST3 holdover. ✓
Fault C: Isolated NE 1 (optic path fails between NE 1 and NEs 2 and 6).
Result: Stabilized to ST3 holdover. ✓

Figure 2B: **Topology 2: One PRS/one Stratum 2 TSG with derived DS-1 inputs; initial SSM are shown.**



X : Failed
✓: Successful

Fault: PRS input to TSG-A failed

- Trial 1: TSG-B enable (NE 5 uses as reference); NEs 1 and 5 provisioned to switch between external and line timing.
  Result 1: Timing loop: "Stratum 1" traceable; No alarms. X
- Trial 2: TSG-A restricted to PRS input.
  Result 2: Timing loop: "Stratum 1" traceable; No alarms. X
- Trial 3: NE 5 restricted to external timing.
  Result 3: Timing loop: "Stratum 2" traceable; No alarms. X
- Trial 4: NE 1 restricted to external timing.
  Result 4: Stabilized to Stratum 2 holdover. ✓

nization distribution, the Extended Superframe Format (ESF)version of the DS1 signal has space in its 4 kbps facility data link for a set of messages similar to the SSM set defined for the OC-*n* S1-byte.

SSM functionality and effectiveness is illustrated by a simple ADM scenario. Figure 1A (page 18) shows the resulting time loop caused by failure of the OC-*n* designated as the primary (preferred) synchronization reference signal when automatic switching between the two received OC-*n* signals is allowed. Figure 1B shows the step-by-step SSM propagation for the same failure and the resulting restoration of Stratum 1 traceability. The significance of the DUS SSM is clearly seen.

SSM TRIAL

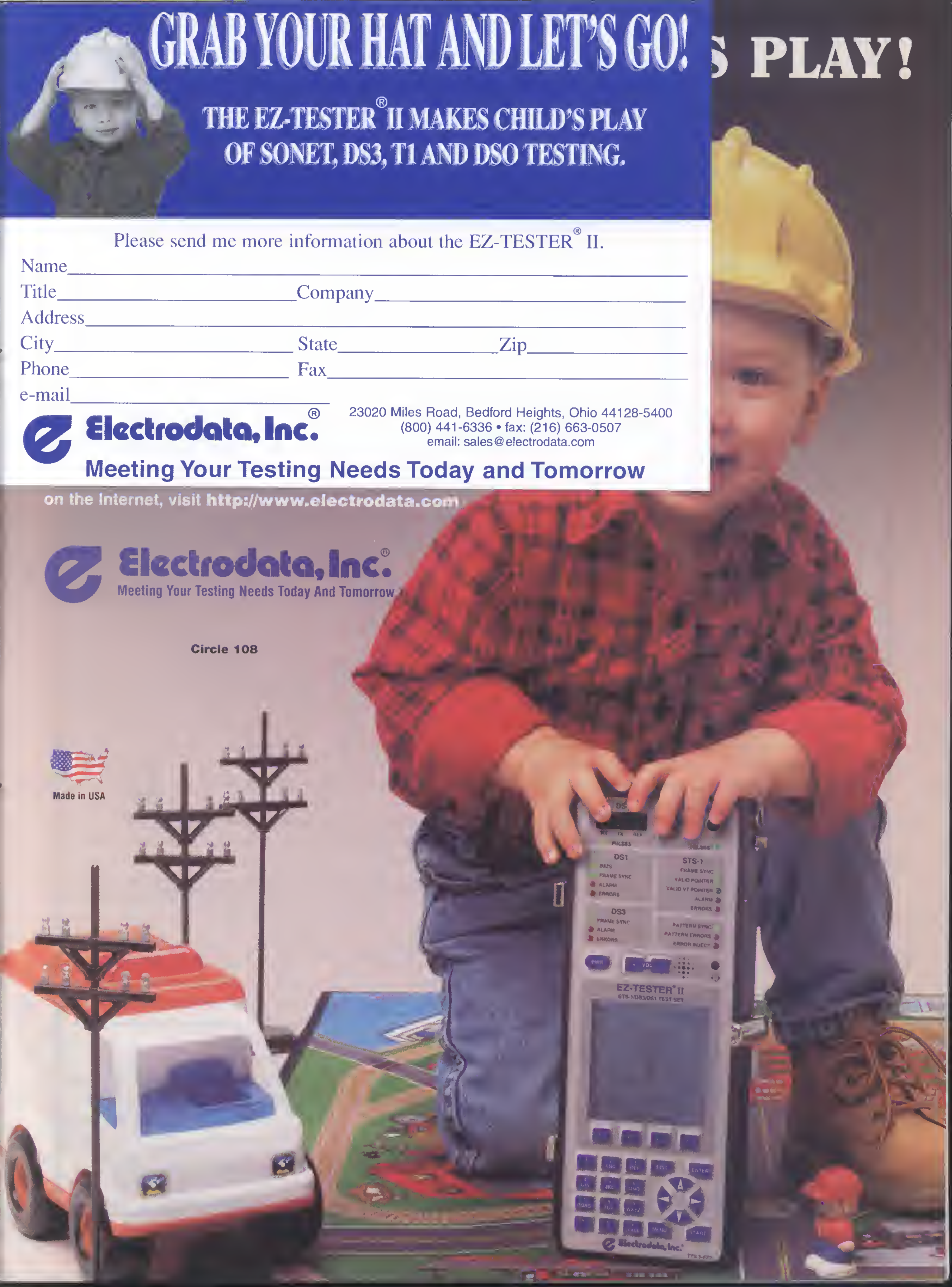
Recent trials involving a Sonet equipment manufacturer (Nortel), a network clock (TSG) supplier (Datum/Austron) and an interexchange carrier (MCI) illuminated SSM application strengths and potential pitfalls. SSM testing was performed on a six-node, bidirectional Sonet OC-48 ring with two Stratum 2 TSGs—one collocated with NE 1 (TSG-A), and the other collocated with NE 5 (TSG-B). Two separate topologies were examined.

The first topology, shown in Figure 2A, had TSG-A slaved to a GPS receiver to form a Stratum 1 quality source (primary reference source, or PRS). NE 1 was externally timed from the PRS. All other network elements were line-timed as shown, but BITS-B was not used.

The six NEs had internal Stratum 3 clocks with external (TSG) timing and line-timing capabilities. The clocks could receive and transit SSM on the OC-48 S1-byte, extract DS1 SSM from the external timing inputs, and pass the S1-byte SSM onto the derived DS1 output (where used). SSM features are subject to provisioning at each NE. The DUS message was provisioned on return OC-*n* paths as described above. The other OC-*n* paths automatically regenerated the Stratum 1 message from the PRS.

The first topology was tested for three separate simulated faults:

- Fault A was a PRS input to TSG-A failure, resulting in timing distribution stabilized to Stratum 2 holdover. This test was successful.



GRAB YOUR HAT AND LET'S GO!

THE EZ-TESTER® II MAKES CHILD'S PLAY OF SONET, DS3, T1 AND DSO TESTING.

Please send me more information about the EZ-TESTER® II.

Name______________________________

Title______________ Company______________

Address______________________________

City____________ State__________ Zip__________

Phone______________ Fax______________

e-mail______________

Electrodata, Inc.®

23020 Miles Road, Bedford Heights, Ohio 44128-5400
(800) 441-6336 • fax: (216) 663-0507
email: sales@electrodata.com

Meeting Your Testing Needs Today and Tomorrow

on the Internet, visit **http://www.electrodata.com**

Electrodata, Inc.®

Meeting Your Testing Needs Today And Tomorrow

Circle 108

Made in USA

Electrodata, Inc.®

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL
FIRST- CLASS MAIL PERMIT NO 1270 CLEVELAND OH
POSTAGE WILL BE PAID BY ADDRESSEE

ELECTRODATA INC
23020 MILES ROAD
BEDFORD HEIGHTS. OH 44128-9924

The STU messag
in situations wher
have been upgrad
allowing graceful

nization distribution, th
Superframe Format (E
the DS1 signal has spac
facility data link for a se
similar to the SSM set d
OC-*n* S1-byte.

SSM functionality an
illustrated by a simple A
Figure 1A (page 18) sh
time loop caused by fail
designated as the prima
synchronization reference signal when automatic switching between the two received OC-*n* signals is allowed. Figure 1B shows the step-by-step SSM propagation for the same failure and the resulting restoration of Stratum 1 traceability. The significance of the DUS SSM is clearly seen.

SSM TRIAL

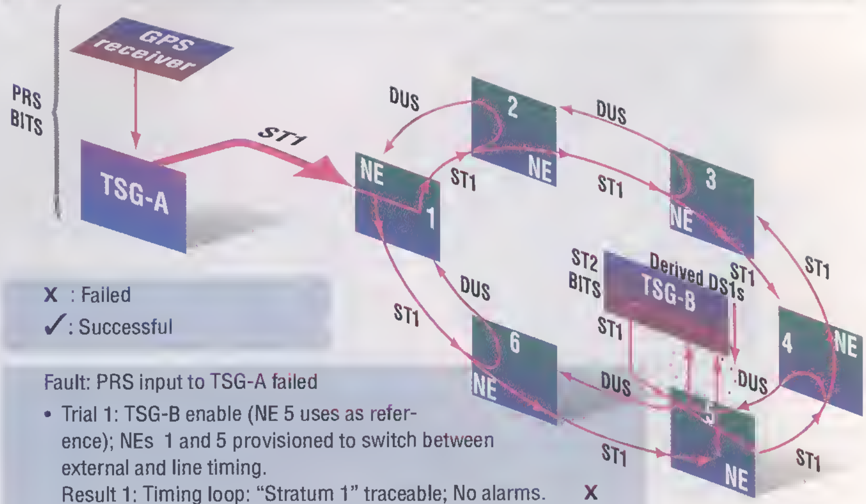
Recent trials involving a Sonet equipment manufacturer (Nortel), a network clock (TSG) supplier (Datum/Austron) and an interexchange carrier (MCI) illuminated SSM application strengths and potential pitfalls. SSM testing was performed on a six-node, bidirectional Sonet OC-48 ring with two Stratum 2 TSGs—one collocated with NE 1 (TSG-A), and the other collocated with NE 5 (TSG-B). Two separate topologies were examined.

The first topology, shown in Figure 2A, had TSG-A slaved to a GPS receiver to form a Stratum 1 quality source (primary reference source, or PRS). NE 1 was externally timed from the PRS. All other network elements were line-timed as shown, but BITS-B was not used.

The six NEs had internal Stratum 3 clocks with external (TSG) timing and line-timing capabilities. The clocks could receive and transit SSM on the OC-48 S1-byte, extract DS1 SSM from the external timing inputs, and pass the S1-byte SSM onto the derived DS1 output (where used). SSM features are subject to provisioning at each NE. The DUS message was provisioned on return OC-*n* paths as described above. The other OC-*n* paths automatically regenerated the Stratum 1 message from the PRS.

Fault B: TSG-A failed.
Result: Stabilized to ST3 holdover. ✓
Fault C: Isolated NE 1 (optic path fails between NE 1 and NEs 2 and 6).
Result: Stabilized to ST3 holdover. ✓

Figure 2B: Topology 2: One PRS/one Stratum 2 TSG with derived DS-1 inputs; initial SSM are shown.



X : Failed
✓: Successful

Fault: PRS input to TSG-A failed

- Trial 1: TSG-B enable (NE 5 uses as reference); NEs 1 and 5 provisioned to switch between external and line timing.
  Result 1: Timing loop: "Stratum 1" traceable; No alarms. X
- Trial 2: TSG-A restricted to PRS input.
  Result 2: Timing loop: "Stratum 1" traceable; No alarms. X
- Trial 3: NE 5 restricted to external timing.
  Result 3: Timing loop: "Stratum 2" traceable; No alarms. X
- Trial 4: NE 1 restricted to external timing.
  Result 4: Stabilized to Stratum 2 holdover. ✓

The first topology was tested for three separate simulated faults:

- Fault A was a PRS input to TSG-A failure, resulting in timing distribution stabilized to Stratum 2 holdover. This test was successful.

SONET,DS3,T1...CHILD'S PLAY!

EZ-TESTER® II

Electrodata introduces the EZ-TESTER II, a new generation test set that adds DS3 and SONET testing to the comprehensive T1 and DS0 capabilities you expect from Electrodata. The EZ-TESTER II is truly easy-to-use and makes child's play of testing data transmission services in a rugged, hand held and truly affordable test set.

Keeping an Electrodata tradition, the EZ-TESTER II is **FORWARD** compatible. You purchase only the capabilities you need today, then easily add additional capability as required. Start with T1 or DS3 testing, add SONET or special capabilities, such as Primary rate ISDN, only when you need them. With Electrodata, today's budget goes further and protects your investment for tomorrow.

For more information, call today **1-800-441-6336** or, on the Internet, visit **http://www.electrodata.com**

Electrodata, Inc.®
Meeting Your Testing Needs Today And Tomorrow

Circle 108

Made in USA

- Fault B was a TSG-A failure (no output DS1 signals), resulting in timing distribution stabilized to Stratum 3 holdover. This test was successful.
- Fault C isolated NE 1 by implementing failed optical paths between NE 1 and NEs 2 and 6. Timing distribution stabilized to Stratum 3 holdover, resulting in a successful test.

The second topology (Figure 2B) was tested four times for a single simulated fault; here, TSG or NE provisioning was modified for each trial, yielding different results.

The first three provided stable but unacceptable results, while the last trial gave the desired stable Stratum 2 holdover state (see below).

The first three trials resulted in timing loops; all NEs were line-timed to each other, but no alarms were indicated, and there was better Stratum traceability (according to the incorrect SSM) than the NE holdover capability. The fourth trial's provisioning was successful, with the ring settling to a stable state with timing distribution traceable to Stratum 2 holdover (the capability of the local TSG clocks).

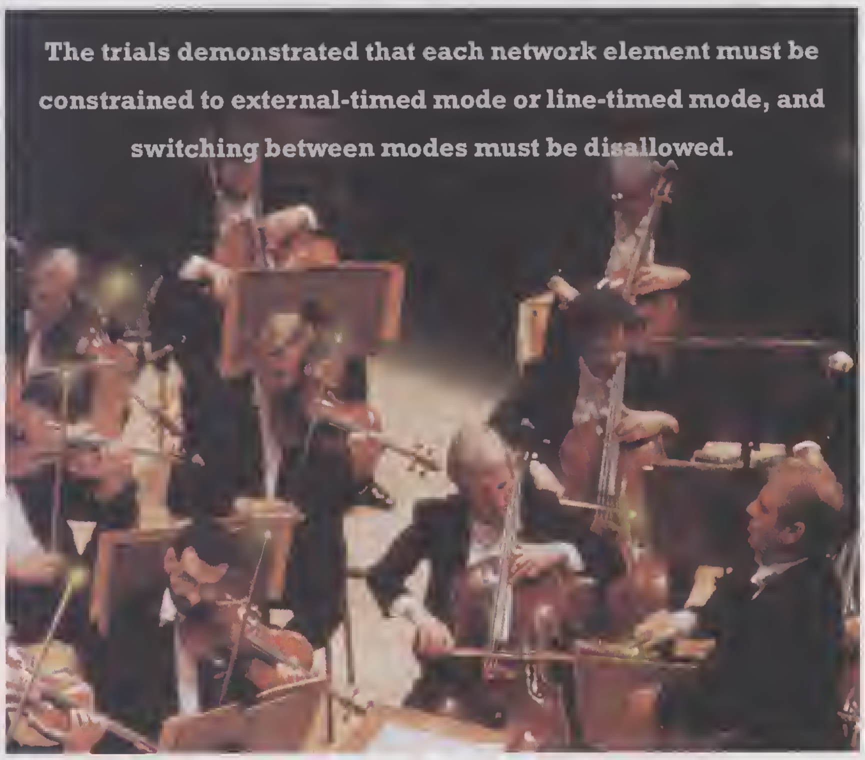
In following tests, a higher-risk option—timing mode switching (external-timing to line-timing and back)—was initially allowed, then constrained incrementally.

The provisioning setup for each trial was changed slightly as tests progressed to the successful case.

- Trial 1 was set up the same as the first topology, except that TSG-B was enabled and NE 5 initially used it as its reference. NEs 1 and 5 were provisioned to switch between external and line timing automatically. This trial failed.
- Trial 2 was the same as Trial 1, except that TSG-A could use only the PRS input. Trial 2 failed.
- Trial 3 was the same as Trial 2, except that NE 5 could not use its optical sources (i.e. no line timing was provided). This trial failed.
- Trial 4 was the same as Trial 2, except that NE 1 could not use its optical sources (i.e. no line timing). Trial 4 was successful.

These trials demonstrated that each network element must be constrained to external-timed mode or line-timed mode, and switching between modes must be disallowed. Additional details regarding the SSM state changes in reaction to the failure for each trial were presented earlier this year to the T1X1.3 committee of the ANSI. (For more information, refer to Contribution T1X1.3/97-028R1; a soft copy is available at the T1 Web site: www.t1.org/index/0805.htm as document 7x130281.pdf, uploaded April 30, 1997.)

The trials demonstrated that each network element must be constrained to external-timed mode or line-timed mode, and switching between modes must be disallowed.



Similar trials (refer to ANSI T1X1.3/97-059; document 7x13059.pdf, uploaded June 9, 1997) have led to adopting the need for defined settling time windows for the SSM changes of state to propagate in response to changes in reference signal paths.

The lessons learned from these trials are being considered for incorporation into a re-issue of the SSM sourcebook. ANSI Technical Report 33, "A Technical Report on Synchronization Network Management Using Synchronization Status Messages," is expected to be updated in 1998.

ONE ITEM IN THE TOOLKIT

The application of SSM is one element in a network manager's management and maintenance toolkit. The SSM will join other optional elements available to Sonet systems, such as frequency deviation detection and pointer justification counts. All must be considered as building blocks for supporting efficient planning and operation of a high-availability synchronization distribution system.

In turn, these functions must be seamlessly integrated with other management systems to ensure efficient operation of an entire Sonet transport system while encompassing, for example, timely maintenance activities, such as fault isolation and deployment of upgraded NEs or features. ■

Mike Green is an advisor in network synchronization standards and planning for Nortel Advanced Technology (Ottawa, Ontario).
G. Scott Henderson is an advisory engineer and manager of NetSynch engineering for MCI Telecommunications Corp. (Richardson, Texas). Ed M. Underwood is senior staff engineer for Datum Inc./Austron Division (Austin, Texas).

NOT ALL NETWORKING SOLUTIONS
come in a box.

If you're searching for answers to your networking problems, look to Pacific Access when you're ready to take stock of your network. We'll analyze your computing environment from the bottom up — with site surveys, inventory audits, and configuration reviews — to provide an accurate, thorough assessment of your entire network. Because the first step toward where you want to go, is knowing where you already are.

So whether you're consolidating your network operations or migrating from legacy systems to leading edge technologies, Pacific Access will help you get started on the right foot. Oh, and about those networking solutions that do come in boxes? Count on the latest Hewlett-Packard workstations and servers, always available when you need them.

There's only one choice.

3079 Kilgore Road
Rancho Cordova, CA 95670
(800) 648-6161
www.pacacc.com

PACIFIC ACCESS®
NETWORK SERVICES AND SOLUTIONS

HEWLETT PACKARD
Channel Partner

Circle 109

RANDY EISENACH

If it's built in, there's a reason for it

Carriers shouldn't switch off performance monitoring features provided in their sonet muxing systems. Here's why.

Despite their benefits, performance monitoring capabilities built into Synchronous Optical Network (Sonet) multiplexers are not widely used. Often, these monitoring or reporting features have been turned off, largely because they are not well understood.

Performance monitoring is filled with strange acronyms and terms such as *primitives, defects, anomalies, CV* and *SES*. It's easy to get lost in the technical jargon and lose sight of the benefits. On top of that, performance monitoring and reporting can generate overwhelming amounts of raw data. Sonet standards themselves support a robust, layered set of performance monitoring parameters that exceed the fault detection and isolation capabilities of previous asynchronous fiber optic multiplexers.

The payoff is that carriers implementing a network-wide performance monitoring strategy can dramatically reduce maintenance and operations costs, improve network reliability and provide new revenue-generating services. All of these benefits can be obtained with little or no new capital expenditures, since performance monitoring features are typically included in sonet multiplexers. However, lacking an understanding of the information, how to filter it and how to apply it to get positive results, many telcos take the easy way out—switching off performance monitoring capabilities.

THE NEED TO MONITOR

Digital transmission systems—initially, T1 carriers and then fiber-optic muxes—introduced the need to monitor the performance of the equipment and the facilities passing through the equipment. As fiber throughput increased, carrying more and more customer voice and data traffic on a single system, multiplexers had to achieve extremely high levels of quality and reliability. This meant that any degradation of the equipment or the facility had to be detected, pinpointed and corrected immediately, before customer service was affected.

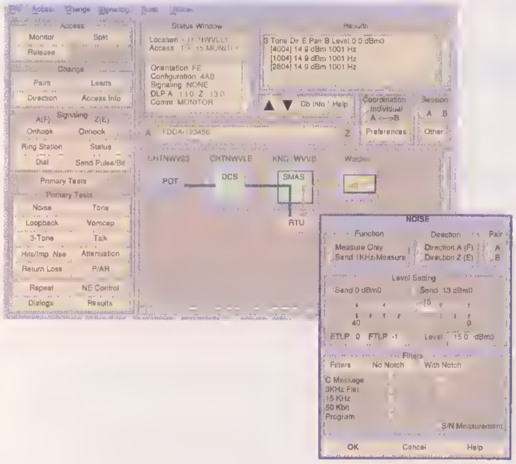
Performance monitoring involves constant background, non-intrusive monitoring, with no effect on customer voice or data traffic. Any changes in quality or performance of the signals are reported in real time. Essentially, there is a built-in DS1, DS3, EC-1 and OC-*n* test set connected to each facility at every Sonet multiplexer in the network.

This aspect of performance monitoring offers a big advantage over traditional troubleshooting techniques. Traditionally, a suspected problem might

continued on page 28

Our New Network Test OSS Is Extremely Powerful And Visually Stimulating. Seat Belts Are Optional.

REACT 2001 changes everything you know about remote network testing.



Orientation FE
Configuration 4AB
Signaling NONE
OLP A 13.0 Z 13.0
Comm MONITOR

3 Tone Dir E Pair B Level 0.0 dBm0
[4004] 14.9 dBm 1001 Hz
[1004] 14.9 dBm 1001 Hz
[2804] 14.9 dBm 1001 Hz

FDDA/123456

ETLP 0 FTLP -1 Level 15.0 dBm0

There's no other operations support system like it.

Troubleshoot problems in your telecommunications network faster than ever before with REACT 2001, the industry's leading testing operations system. With it you'll have unequalled power to install and maintain today's network services and tomorrow's leading edge technologies.

Power at the click of a button.

REACT 2001 combines the latest advances in client/server and database technology with a dynamic new graphical user interface. Network technicians get a complete view of the circuit under test and available testing options at a single glance. Powerful transmission and protocol-based tests are simplified and testing efficiency is maximized like never before.

For solving network problems, no system is more effective.

Hekimian's expertise at delivering industry standards coupled with real world experience is designed into the core of REACT 2001. The system will integrate smoothly with your existing corporate databases, other operations support systems, and network elements.

Experience the power REACT 2001 puts at your fingertips. **Give Hekimian a call today at 301-590-3600.**

HEKIMIAN

AN AXEL JOHNSON INC. COMPANY

Circle 131

Theirs.

Ours.

ATM products built for demanding terrain.

When it comes to carrying "mission critical" cargo, you can depend on Hitachi's ATM solutions to go the distance. We keep you "humming along" as your landscape evolves from a traditional network to an ATM environment. Hitachi's ATM systems economically scale the gap between individual service connections and backbone connections. They're built from the ground up to protect your customer's vital interests--and your investment. You name it, Hitachi's ATM systems run on any kind of fuel--Frame, Cell and Internet Protocol. So, for versatility and reliability, why toy around with theirs, when you can have ours? The one that stops at nothing.

HITACHI

Experience. The Difference.

Hitachi Telecom (USA), Inc. • 3617 Parkway Lane, Norcross, GA 30092 • 1-800-446-8820 • http://www.hitel.com

Circle 110

continued from page 24

require several technicians, multiple site visits and service interruption to pinpoint and correct a failure. Performance monitoring can detect and pinpoint these failures more efficiently and without service interruption, reducing customer complaints and increasing network quality.

Performance Monitoring Terms

The most common performance monitoring parameters are indicated below. A complete list is available in Bellcore GR-820-CORE and ANSI T1.231. Using these, a carrier quickly can determine whether any errors have occurred and pinpoint which facilities are causing problems. Once a degraded facility is identified, individual parameters indicate the cause and extent of the problem.

Code violation (CV)—This simply means some type of error was received in the digital signal. Line code violations monitor whether there were received bipolar violations. (For example, were the 1s and 0s received on the line in the proper coding and format?) Path code violations monitor error detection and correction information at the path layer and provide a count of the number of failures.

Errored second (ES)—A count of the number of seconds in which at least one code violation was received.

Protection switch count (PSC)—A count of the number of times service is switched between the protection and working lines.

Severely errored second (SES)—Occasional code violations and errored seconds are common. SES provides an indication of how many seconds the network was severely degraded. SES is based on a specific number of code violations in a given second; the exact number of violations depends on the signal that is being monitored, such as DS1, DS3, OC-3 and OC-48.

Severely errored frame/alarm indication signal (SAS)—A one-second period containing multiple frame errors or an alarm indication signal.

Unavailable seconds (UAS)—A count of the number of seconds the path or line is unavailable.

Network failures or degradations typically fall into three categories (and performance monitoring is especially adept at solving the last two):

- *Hard failures* are the abrupt, total outages of a facility or equipment, and can result from a fiber cut or a failed circuit card. They usually don't result in a loss of traffic, thanks to facility and equipment protection on Sonet muxes. Hard failures tend to be easy to detect and are reported as an alarm condition.
- *Soft failures* are the slow degradation of a facility over time. Left undetected, they eventually can interrupt service. Particularly with data traffic, soft failures may lead to a high number of data packet re-transmissions and customer perceptions of low network quality.
- *Intermittent failures* are those pesky problems that come and go, and can be difficult—and expensive—to fix.

Different performance monitoring layers allow degradation to be detected and pinpointed to the exact location of a fault.

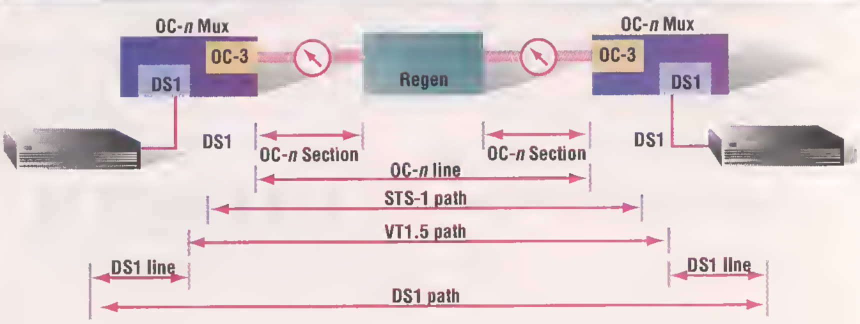
Performance monitoring may be a maze of confusing terms and acronyms, but the concepts themselves are simple. Most sonet muxes provide a robust, layered set of performance monitoring parameters. The term layered refers to different segments of the network, such as OC-*n* line or DS1 path. These different performance monitoring layers, or segments, allow degradation to be detected and pinpointed to the exact location of a fault.

In general, performance monitoring parameters (PMs) are divided into two categories: *line PMs* and *path PMs*. A line can be viewed as a pipe and the path as what flows in the pipe. Line performance monitoring can detect "leaks" in the pipe, but cannot determine what's actually flowing through the pipe, which is usually customers' data or voice traffic.

Path-level PMs check what actually flows through the pipe. By monitoring both the line and path layers, a carrier can proactively resolve customer and network degradations. Sonet equipment supports DS-*n* Line and DS-*n* Path performance monitoring, as well as parameters for EC-1, VT1.5, STS-1 and OC-*n* signals.

The concept of a "path" extends beyond DS-*n* signals. Any time a facility is created or mapped into a Sonet payload, a path layer is formed. Path PMs will monitor the end-to-end performance of a specific layer. When a DS1 data signal is generated by a customer's router, the DS1 path extends from that router to the router at other side of the network, where the DS1 is delivered. If the DS1 is carried on a Sonet network, a VT1.5 path is created when the DS1 is mapped into a sonet VT1.5 payload. VT1.5 Path monitors check the quality of the signal from the time a DS1 is mapped into a VT1.5 until the point it is demuxed into its original DS1 format. Since VT1.5 payloads are mapped further into an STS-1, an STS-1 Path layer is developed between the points where the STS-1 is generated

Figure 1: Line, path and section divisions



America's Network **Subscribe FREE!**

☐ **YES! I wish to receive (continue to receive) *America's Network* absolutely FREE!** ☐ **No**

SIGNATURE__________ DATE__________
NAME__________
TITLE__________
COMPANY__________
DELIVERY ADDRESS__________
CITY__________ STATE/PROVINCE__________
ZIP/POSTCODE__________ COUNTRY__________
PHONE__________
FAX__________
INTERNET/E-MAIL__________

To qualify for your FREE subscription, you must answer these FOUR questions: *(Fill in oval completely, as shown: ●)*

1. What is the primary business activity of your firm? *(Fill in **ONE** only.)*
- 100 ○ Telecommunications Carrier/Network Service Provider/Holding Co.
- 525 ○ Utility
- 575 ○ Computer Service Firm/Software Developer or Other Computer/Electronic-Related Industries
- 145 ○ Telecommunications Consulting/Engineering Co.
- 135 ○ Construction Contractor
- 152 ○ Telecommunications Equipment Vendor, Reseller, VAR or Distributor
- 500 ○ Finance/Investment/Banking
- 600 ○ Corporate/Private/Government Telecommunications User
- 625 ○ Association
- 400 ○ Other __________ *(please specify)*

We reserve the right to reject any incomplete or unqualified requests.

2. Which of the following services does your co. provide? *(Fill in **ALL** that apply.)*
- A ○ Interexchange Carrier/Long-Distance Service Provider
- B ○ Local Exchange Carrier
- C ○ Cellular Carrier
- D ○ PCS Operator
- E ○ Paging & Message
- F ○ Satellite Communications
- G ○ Other Wireless Operator
- H ○ MSO (Two or more Cable TV Systems)
- I ○ Independent Cable TV System
- J ○ Cable TV Contractor/Engineering Firm
- K ○ Other Cable
- L ○ Competitive Access Provider (CAP)
- M ○ Telecommunications Reseller
- N ○ Internet Service Provider/Commercial Online Service Co.
- O ○ Systems Integration/Outsourcing
- P ○ Other Carrier
- Q ○ OTHER __________ *(please specify)*

3. Which of the following describes your title classification? *(Fill in **ONE** only.)*
- 11 ○ **Technical Mgmt.** (Engineering VP, Director or Mgr.; Technical VP, Director or Mgr.; Network VP, Director or Mgr.; Plant Mgr.)
- 12 ○ **Engineering** (Network Designer, Engineer, Technician)
- 25 ○ **Data Communications/Digital/IS/MIS Mgmt.** (Data Communications, Digital, I/S VP, Director or Mgr.)
- 13 ○ **Mgmt.** (VP, General Mgr., System Mgr., Mgr., Director)
- 3 ○ **Corporate Mgmt.** (Chairman, Owner, President, Partner, Executive/Senior VP/Director, Treasurer, CFO, COO)
- 4 ○ **Legal, Financial, Regulatory or Processing Services** (Director or Mgr. of Rate Planning & Administration, Service Costs, Methods)
- 5 ○ **Personnel & Administrative Services** (Director or Mgr. of Training, Safety, Security, Buildings & Land, Supplies & Distribution)
- 16 ○ **Sales/Marketing** (Sales or Marketing VP, Director, Mgr., Representative)
- 20 ○ **Purchasing** (Purchasing, Materials, Contract VP, Director or Mgr.)
- 7 ○ **Other** (Co. Copies and Other Titled and Non-Titled Personnel)

4. Which of the follow equipment/services do you purchase, recommend, specify, approve or otherwise influence the purchase of? *(Fill in **ALL** that apply.)*
- A ○ **Wireless/Cellular/Mobile/PCS Equip./Services**
- B ○ **Central Office Equip./Services** (CO Switching Equip. [digital, ATM], Programmable Switches, Operations Support Systems, Workstations, CO Test, Hardware, Frames)
- C ○ **Transmission and Broadband Distribution Equip./Services** (Digital Loop Carriers, Sonet, T1, Microwave, Satellites, Digital Cross Connects, Amplifiers, Passives, Cable, Long Haul Transmission Systems, Loop Distribution and Electronic Systems, Multiplexers)
- D ○ **Cable/Video/Multimedia Equip./Services** (Headend Equip., Antennas, Switches, Receivers, Studio Equip., Audio Processors, Fiber/Coax Systems, Network Mgmt., Video Servers, Video Operations Support Systems, Set Top Equip.)
- E ○ **Customer Premises, Broadband Subscriber Equip./Services** (PBXs, Station Equip., ACOs, Videoconferencing, Remote Controls, Converters)
- F ○ **Outside Plant and Construction Equip./Services** (Pedestals, Vehicles, Towers, Tools, Enclosures)
- G ○ **Data Communications/MIS/Network Mgmt. Support Equip./Services** (including LANs, WANs, & Network Software)
- H ○ **Power & Protection**
- I ○ **Test & Measurement**
- J ○ **Other** *(please specify)*__________
- K ○ None of the Above (A–J)

97B3

Fast action FAX: 1-218-723-9437

Free subscription offer valid in the U.S., its possessions, and Canada only.
Mexico (24 issues) $64. All other countries (24 issues) $84.
☐ Add $90 per order for airmail delivery. Payable in U.S. dollars drawn on a U.S. bank.

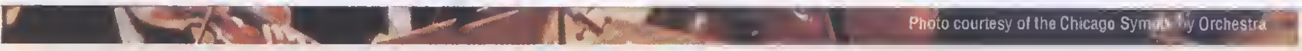


Photo courtesy of the Chicago Symphony Orchestra

and demuxed. Line and Section performance monitors watch over the actual quality of the line and fiber interfaces connecting the various pieces of network equipment.

It's easy to question the need for all the layers, since it does seem like a tremendous amount of information. The layered approach allows the network to detect and isolate a fault condition quickly, saving time, money and manpower when correcting network degradations. Without the many performance monitoring layers, a degradation may be detected, but there is no way to locate the problem and no indication of a probable cause.

Monitoring subtle degradations requires a historical view of the performance parameters over a certain time period. Simply reporting the parameters is not enough; proper collection, storage and analysis of performance monitoring data is required—and offered by Sonet muxes. Information is stored in registers that are incremented whenever an error condition is detected.

Sonet equipment provides performance monitoring registers for the current 15-minute and one-day periods. Once a time period lapses, register counts are stored and a new register starts for the next time period. For historical purposes, the current 15-minute and day registers, as well as the last 32 15-minute registers and the last day register, are stored. Each Sonet network element provides a sliding window of performance history for each of its facilities. For long-term data storage and historical trend analysis, performance monitoring information can be reported to an operations support (OS) system or network manager.

VAST AMOUNTS OF DATA

The tremendous performance monitoring and reporting capability of Sonet equipment produces vast, and sometimes overwhelming, amounts of raw data. A common problem is merely interpreting the meaning and importance of the parameters. In addition, simply collecting the raw counts over established data communications networks (DCNs), such as a 9.6 kbps X.25 connection, can easily overwhelm existing OAM&P message traffic, bringing a data network and performance monitoring collection device to a virtual standstill.

A common reason for turning off performance monitoring is to avoid flooding the OS with messages. Fortunately, carriers can get the benefits of Sonet performance monitoring without overwhelming the DCN or an OS. A single OC-3 mux easily can generate more than a thousand separate performance monitoring parameters. With full, autonomous reporting enabled, all parameters with non-zero counts will report their status every 15 minutes. Multiply that across an entire ring or network, and the potential message traffic is gigantic, especially over a slow-speed gateway connection.

Fortunately, many DCNs are being upgraded to an Open Systems Interconnection/local area network (OSI/LAN) environment, employing bandwidths of up to 10 Mbps to each gateway network element. While more bandwidth eliminates the bottleneck of transmitting raw performance monitoring data, there is no guarantee that an OS or network manager can process all

NO POSTAGE
NECESSARY IF
MAILED IN THE
UNITED STATES

BUSINESS REPLY MAIL
FIRST-CLASS MAIL PERMIT NO 665 DULUTH MN

POSTAGE WILL BE PAID BY ADDRESSEE

America's Network
ADVANSTAR COMMUNICATIONS INC
PO BOX 6100
DULUTH MN 55806-9800
USA

means some type of error was received in the digital signal. Line code violations monitor whether there were received bipolar violations. (For example, were the 1s and 0s received on the line in the proper coding and format?) Path code violations monitor error detection and correction information at the path layer and provide a count of the number of failures.

Errored second (ES)—A count of the number of seconds in which at least one code violation was received.

Protection switch count (PSC)—A count of the number of times service is switched between the protection and working lines.

Severely errored second (SES)—Occasional code violations and errored seconds are common. SES provides an indication of how many seconds the network was severely degraded. SES is based on a specific number of code violations in a given second; the exact number of violations depends on the signal that is being monitored, such as DS1, DS3, OC-3 and OC-48.

Severely errored frame/alarm indication signal (SAS)—A one-second period containing multiple frame errors or an alarm indication signal.

Unavailable seconds (UAS)—A count of the number of seconds the path or line is unavailable.

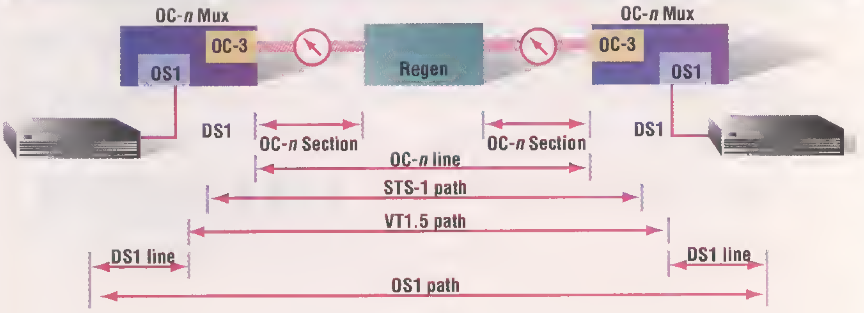
problems that come and go, and can be difficult—and expensive—to fix.

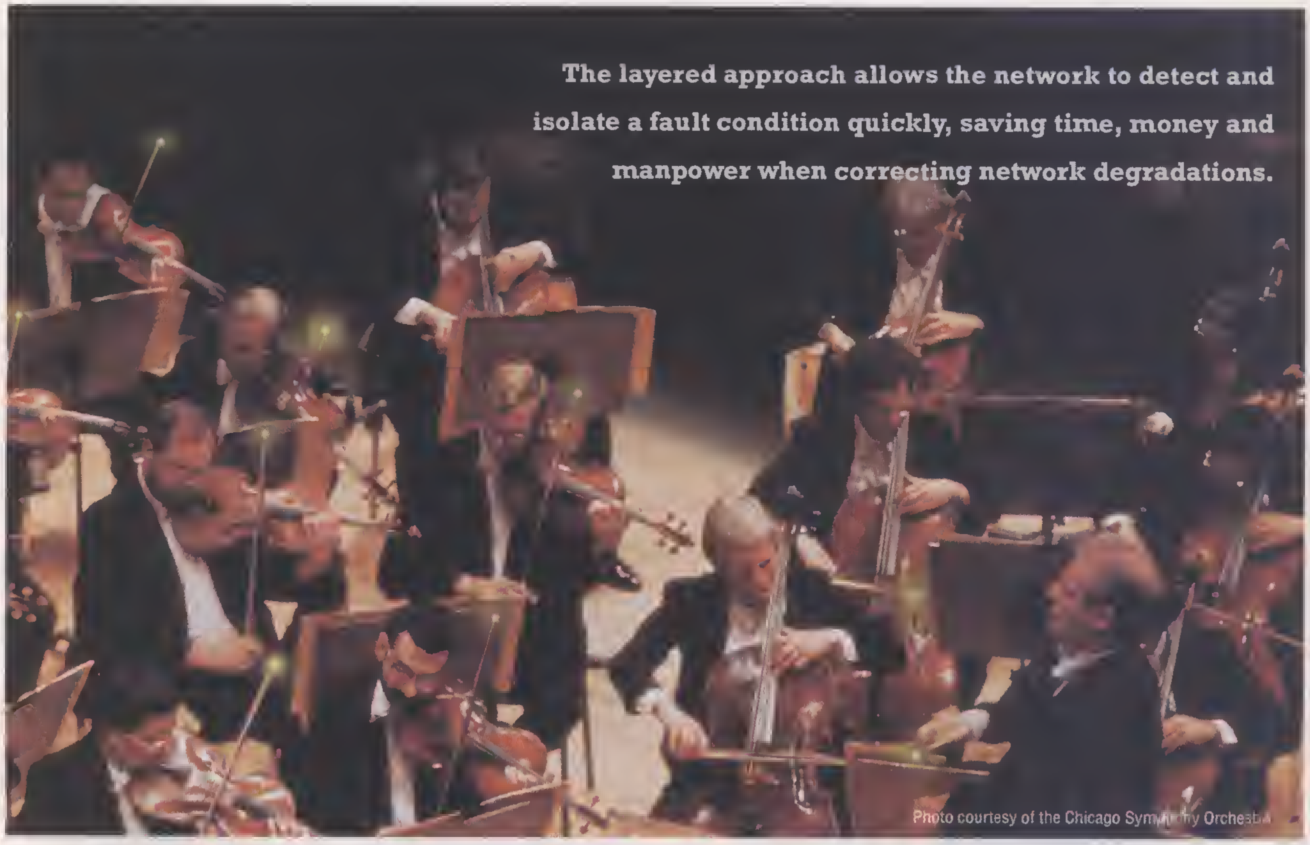
Performance monitoring may be a maze of confusing terms and acronyms, but the concepts themselves are simple. Most sonet muxes provide a robust, layered set of performance monitoring parameters. The term layered refers to different segments of the network, such as OC-*n* line or DS1 path. These different performance monitoring layers, or segments, allow degradation to be detected and pinpointed to the exact location of a fault.

In general, performance monitoring parameters (PMs) are divided into two categories: *line PMs* and *path PMs*. A

Sonet payload, a path layer is formed. Path PMs will monitor the end-to-end performance of a specific layer. When a DS1 data signal is generated by a customer's router, the DS1 path extends from that router to the router at other side of the network, where the DS1 is delivered. If the DS1 is carried on a Sonet network, a VT1.5 path is created when the DS1 is mapped into a sonet VT1.5 payload. VT1.5 Path monitors check the quality of the signal from the time a DS1 is mapped into a VT1.5 until the point it is demuxed into its original DS1 format. Since VT1.5 payloads are mapped further into an STS-1, an STS-1 Path layer is developed between the points where the STS-1 is generated

Figure 1: Line, path and section divisions





The layered approach allows the network to detect and isolate a fault condition quickly, saving time, money and manpower when correcting network degradations.

Photo courtesy of the Chicago Symphony Orchestra

and demuxed. Line and Section performance monitors watch over the actual quality of the line and fiber interfaces connecting the various pieces of network equipment.

It's easy to question the need for all the layers, since it does seem like a tremendous amount of information. The layered approach allows the network to detect and isolate a fault condition quickly, saving time, money and manpower when correcting network degradations. Without the many performance monitoring layers, a degradation may be detected, but there is no way to locate the problem and no indication of a probable cause.

Monitoring subtle degradations requires a historical view of the performance parameters over a certain time period. Simply reporting the parameters is not enough; proper collection, storage and analysis of performance monitoring data is required—and offered by Sonet muxes. Information is stored in registers that are incremented whenever an error condition is detected.

Sonet equipment provides performance monitoring registers for the current 15-minute and one-day periods. Once a time period lapses, register counts are stored and a new register starts for the next time period. For historical purposes, the current 15-minute and day registers, as well as the last 32 15-minute registers and the last day register, are stored. Each Sonet network element provides a sliding window of performance history for each of its facilities. For long-term data storage and historical trend analysis, performance monitoring information can be reported to an operations support (OS) system or network manager.

VAST AMOUNTS OF DATA

The tremendous performance monitoring and reporting capability of Sonet equipment produces vast, and sometimes overwhelming, amounts of raw data. A common problem is merely interpreting the meaning and importance of the parameters. In addition, simply collecting the raw counts over established data communications networks (DCNs), such as a 9.6 kbps X.25 connection, can easily overwhelm existing OAM&P message traffic, bringing a data network and performance monitoring collection device to a virtual standstill.

A common reason for turning off performance monitoring is to avoid flooding the OS with messages. Fortunately, carriers can get the benefits of Sonet performance monitoring without overwhelming the DCN or an OS. A single OC-3 mux easily can generate more than a thousand separate performance monitoring parameters. With full, autonomous reporting enabled, all parameters with non-zero counts will report their status every 15 minutes. Multiply that across an entire ring or network, and the potential message traffic is gigantic, especially over a slow-speed gateway connection.

Fortunately, many DCNs are being upgraded to an Open Systems Interconnection/local area network (OSI/LAN) environment, employing bandwidths of up to 10 Mbps to each gateway network element. While more bandwidth eliminates the bottleneck of transmitting raw performance monitoring data, there is no guarantee that an OS or network manager can process all the messages. The solution is to implement a robust performance monitoring strategy throughout the network, but also make use of the filtering capabilities of Sonet muxes (such as threshold crossing alerts) and leave the autonomous reporting of raw counts turned off.

All digital networks will see occasional errors, most of which do not warrant reporting to a centralized OS or any maintenance activity. Sonet muxes will record any error event or degradation, no matter how small, but can filter out the parameters with error counts so low that they have no impact on customer service or overall network quality. By filtering the information, a carrier can focus on facilities that are truly degraded and need corrective action.

Filtering the raw performance monitoring counts eliminates most message traffic to an OS or centralized monitoring device. Sonet muxes collect the raw PM information, analyze it, and decide whether a degradation is severe enough to issue an alarm. The Sonet mux acts as a distributed, intelligent monitoring device. Filtering is implemented using threshold crossing alerts. Each parameter has a user-settable threshold which, if crossed, will trigger an alert or alarm. A few bit errors on a DS1 signal in a 15-minute window is neither unusual nor service-affecting.

> **Sonet muxes will record any error event, no matter how small, but can filter out parameters with error counts so low that they have no impact on network quality.**

However, a carrier may want to be notified if bit errors in a given period exceed a certain threshold. The thresholds can be adjusted on a per-facility and per-parameter basis. To simplify their initial use, most Sonet vendors provide default threshold values for each parameter.

THE BENEFITS

Carriers implementing a network-wide performance monitoring strategy can reduce their maintenance and operations costs dramatically, improve network reliability and provide new revenue-generating services. All these benefits (for a sampling of the benefits, see sidebar) come free, since most sonet vendors support performance monitoring as part of their basic package.

It will be a long time before the telecommunications network is all-Sonet; thus, complementary use of performance monitoring units provides an additional layer of protection for asynchronous portions of the network. ■

Randy Eisenach is technical marketing manager for Fujitsu Network Communications (Richardson, Texas).

The benefits of performance monitoring

Using the complimentary performance monitoring capabilities included in Sonet multiplexing systems can provide several key benefits for carriers:

- **Improved network reliability and quality due to pro-active monitoring.** Rather than simply reacting to network outages and customer complaints, a carrier can detect degrading facilities ahead of time, and take steps to ensure high-quality performance.
- **Detection of degrading facilities before an outage or trouble ticket**. By performing trend analysis on the information or by watching for threshold crossing alerts, it's possible to spot soft and intermittent failures.
- **Lower cost and time in detecting and diagnosing fault conditions.** Sonet equipment provides a robust, layered performance monitoring structure intended to diagnose and pinpoint the location of a degradation quickly. Rather than two, three or four maintenance centers tracking a common problem, the root cause can be isolated to a specific facility or segment.
- **Support for tiered service levels that can provide revenue.** Particularly with DS1s, carriers can offer guaranteed grades of service at several price levels. DS1 facilities are widely used for data transport, and many customers may be willing to pay a premium for a significantly lower bit error rate. In reality, both OS1 facilities are provided using the same Sonet equipment, so the network provider can offer new revenue-generating services with little or no new capital expenditures. The DS1 with the better bit error rate is simply monitored more closely, using Sonet's internal performance monitoring capabilities.
- **Better fault detection/sectionalization at point of presence (POP) or customer premises equipment (CPE) network boundaries.** Traditionally, network boundaries or demarcations between local exchange carriers (LECs), or between a LEC and an interexchange carrier (IXC), cause problems when diagnosing facility problems that cross borders. Often, maintenance centers for both companies troubleshoot a single common problem. In the worst case, the demarcation leads to rounds of finger-pointing before the root cause of the degradation is identified. Performance monitoring easily and quickly isolates network degradations to the appropriate location of the fault, eliminating duplicate efforts and finger pointing. Also, many telcos still prefer a DS3 handoff at POPs even when Sonet equipment is available and the handoff could be at an EC-1 or OC-3 rate. A key benefit of interconnecting networks at a Sonet level, with an EC-1 or OC-3 signal rather than a OS3, is that it maintains the end-to-end STS-1 Path and VT1.5 Path performance monitoring parameters. Thus, a Sonet-level interconnection extends the performance monitoring benefits across network boundaries.
- **Reduced need for and cost of external performance monitoring units.** Several companies manufacture external performance monitoring units specifically designed for information collection, storage and analysis. Most external units provide excellent capabilities, but duplicate features of existing Sonet muxes. These units and Sonet muxes, used in a complementary fashion, can cut costs when compared with overlapping the same performance monitoring capabilities on separate devices. Performance monitoring units are adept at monitoring and analyzing asynchronous DS3 and DS1 signals, particularly at network boundaries. Most offer Intermediate Path Level performance monitoring—the ability to monitor a signal simply passing through an element, but not terminating at that node. Monitoring a OS3 handoff signal at a POP or monitoring the embedded DS1s within the larger DS3 are examples of intermediate performance monitoring typically supported by external units. As these POP and network demarcation points migrate to Sonet-level interconnects using EC-1 and OC-*n* signals, more performance monitoring can be achieved solely by using the embedded capabilities of the Sonet mux.

Headline:

Put 288 Voice Channels over a Single T1

Photo:

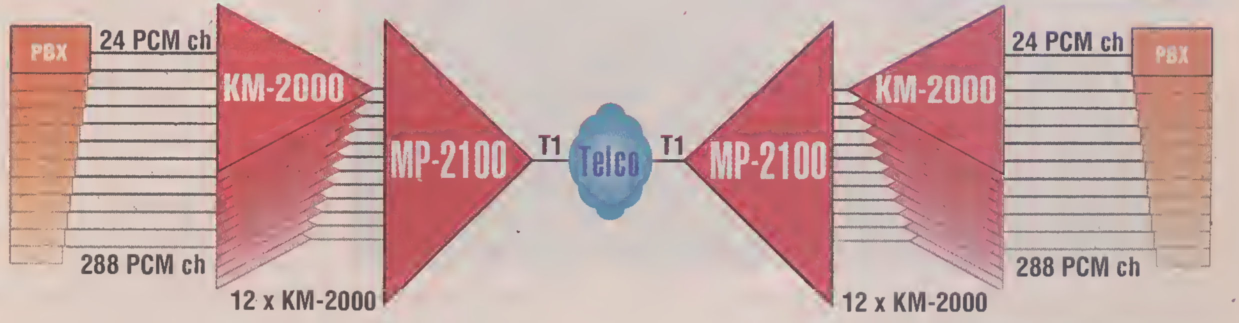
Product name: Megaplex-2100 and Kilomux-2000

Description: **T1/E1 integrating multiplexer system**

Benefit: Implementation of voice compression algorithm MPMLQ™ in the Megaplex-2100 and Kilomux-2000 multiplexer system increases the throughput for voice and data over a single T1 link. **Toll quality voice at 4.8 Kbps**, supporting **288 voice channels over a single T1 link.** Automatic detection between voice and fax. **SNMP management** from central site over standard HP Open View management platform, or via PC. Fail-safe operation with **complete redundancy**. Transmission over **leased lines, fiber, or satellite.**

Contact: **Toll free 1-800-444-7234** or
market@radusa.com
web: **http://www.rad.com**

Application:



Boring ads. Brilliant solutions.

RAD
data communications

ISO 9000,9001,9002 Approved
GSA#: East GS-35F-3014D West GS-35F-3233D

Circle 111

RAD Data Communications, Inc. e-mail: market@radusa.com Toll Free: 1-800-444-7234
U.S. Headquarters: 900 Corporate Drive, Mahwah, NJ 07430 Tel: 201/529-1100 Fax: 201/529-5777 Midwest: Tel: 847/342-9999 Fax: 847/342-9986
West Coast: Tel: 714/897-2448 Fax: 714/891-1764 International Headquarters: 8 Hanechoshet Street, Tel Aviv 69710 Israel Tel: 972-3-6458181 Fax: 972-3-6498250

ARIELLE EMMETT

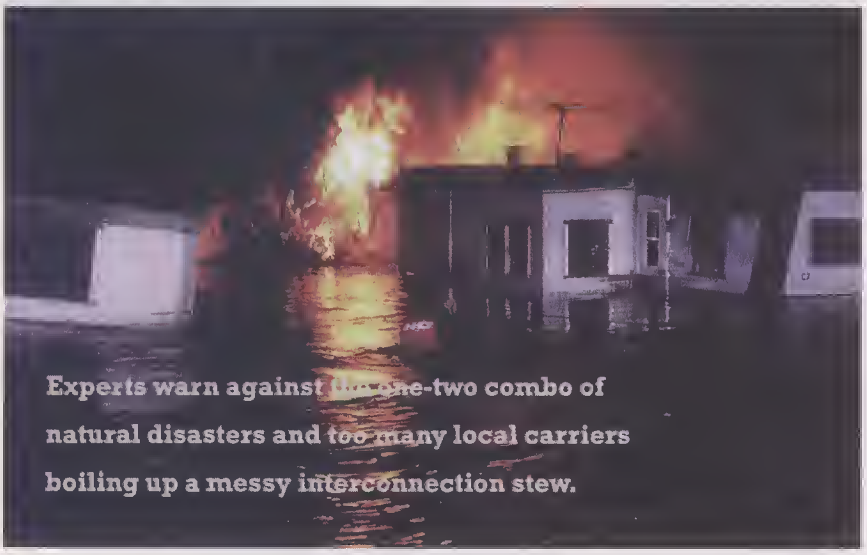
Network, Heal Thyself, Part II:

The dangers of inertia

Our Aug. 15 issue provided perspectives on how new technologies may give network operators a greater sense of security. We continue our three-part series on network reliability by exploring how tenuous that sense of security may be.

Everyone plays a role in assessing vulnerability and threats to the network. Major vendors and carriers tend to emphasize the protective and self-healing aspects of internetworking and physical layer technology. Analysts, disaster recovery experts, market researchers and business development experts point to the looming threat of major outages from unpoliced cable excavations and software bugs associated with unbundling and LNP database introduction. Analysts point to the overall neglect of outside plant, especially in the local exchange, and the problem of too many service providers boiling up a messy interconnection stew.

Much of the threat appears to be man-made, the result of bureaucratic inertia, disbelief and the standard government approach to disputed claims—the "call for more data." In July, the Federal Communications Commission (FCC) issued a Final Report of the Network Reliability and Interoperability Council (NRIC). The NRIC's conclusions were alarmingly prosaic: fear of cable cuts and Internet traffic overloads; failure of federal legislators to push through tougher cable cut enforcement legislation—all were underscored without anyone sounding alarm or calls to action.



Experts warn against the one-two combo of natural disasters and too many local carriers boiling up a messy interconnection stew.

The one exception NRIC explored was a template to guide carriers through interoperability issues. These will "address concerns about the potential of Internet usage to cause congestion on the public switched network," according to the FCC. The NRIC has developed "an Internet Interconnection Specification Template to guide network planning between Internet service providers [ISPs] and common carriers who interconnect with them to deliver Internet services to end users."

The NRIC demurred on tougher questions, such as the danger of crosstalk and interference between loops in the same or adjacent binder groups when used for high-speed services, and the levels of interconnection between wireline and wireless systems. The council dismissed the need for establishing international interoperability/reliability groups to handle oversight of the global signaling network, suggesting that existing oversight is adequate.

"The real message of the report is that there isn't much that's different from 1993 [when the first report was issued]," says Jim Keegan, FCC associate chief of networks. "When NRIC was started, it was after a series of major network service outages that were unprecedented in scope. A 1990 outage in the AT&T signaling network, for example, caused millions of people to be out of service simultaneously in the middle of the day. Incidents such as these prompted FCC to establish the [NRIC]." Part of the mandate was requiring that carriers report an outage that met a certain threshold—for example, 30,000 customers affected for more than 30 minutes. This allowed the government to assemble a data bank of service outages and force carriers to disclose vulnerabilities, where there was less incentive to share this kind of data in the past, he explains.

On the surface, virtually nothing in the disaster scenario has changed, despite the near-exponential rate of change in the network. "The biggest single cause of service outages are cable cuts due to unmonitored excavation," Keegan says. Texas, for example, has no one-call law and, as a result, reports more than 20% of the fiber dig-ups in the country, he notes.

"The biggest risk to signaling is software problems—and that's a big concern, because this is involved in a number of major outages," Keegan adds. Yet despite a loss of network diversity due to the deeper penetration and concentration of traffic on fiber, the FCC is optimistic that unbundling and interconnection agreements can go forward without too many problems.

"The one big issue ... is testing for LNP and unbundling," Keegan says. "Within the last few weeks, the industry has closed a testing plan for number portability, and that's being administered under the Alliance for Telecommunications Industry Solutions [ATIS]. In fact, the single biggest way to treat LNP risks is testing. In operational support systems [OSSs], what the council's report tells us is that there are strategies that exist to maintain security. The council has also laid out in some detail how those risks are addressed, in terms of auditing, authentication and people getting into the [OSS]. Our conclusions about the third issue, connection of wireless systems, is that we have to rely on industry standards" or build a reliance on standards groups. In short, no news is 'okay' news.

But is there *no* news? Analysts disagree. "The complexity of the network has increased geometrically, along with the numbers of providers that need to interconnect," explains David Yedwab, vice president of the Eastern Management Group (Parsippany, N.J.). "Where there's increased complexity, there's increased possibility of failure. For example, as the Internet congestion phenomenon continues, we can get unpredicted hotspots happening for reasons that were unknown even six months earlier."

The network has unprecedented strengths; SS7 signaling, for example, is more powerful and predictive than ever, Yedwab says. "It gives us the ability to look ahead and figure out if a pattern is available that the signaling network was designed to handle," he says.

Yet traffic loads will increase to unbelievable levels. "We sort of forget that we're asking the network to perform and execute transactions that are orders of magnitude more than before, starting with 800 number portability and moving onto [LNP]," Yedwab says. "The network is going to have to be reengineered to handle as many as two-plus orders of magnitude the number of transactions once LNP is implemented. Reengineering or the capacity improvements required may be so extensive that we might need to change out to a faster signaling technology, whether we use the magic ATM or fast-packet switching and addressing. The current signaling network, SS7, is still based on X.25. We may find that's a limiting factor at some point."

There is a spectrum of opinion on vulnerability. Yet many of the opinions shared on the following pages are based not only on factual information, but also on the political and interpretive roles each expert plays within the context of the telecom environment—vendors pushing tools; disaster experts conveying experiences; government officials defending the deregulation bible. *AN* talks with The Skeptic, The Risk Manager, The Sonet Saviors and The Industry Watchdog.

THE SKEPTIC: RON COWLES, R&D MANAGER AT NORTHERN BUSINESS INFORMATION

Are telcos working as effectively as they should on interconnection agreements?

I don't believe that those trying to compete are negotiating interconnection agreements to the extent that they eventually will. The Telecom Act means that providers must connect at any feasible point; a competitor might want to interconnect with a cross-connect device, for example, so the incumbent would provide the facilities.

What may happen could lead to increased worker activity; and that leads to bad pairs and bad facilities. In fact, the more activity within your network, whether electronic or physical, the more vulnerable it gets. With workers making physical changes and with multiple numbers of workers, that leads to potential for a more unreliable network.

There's a huge effort to remove subsidies out of incumbent LECs' access rates. They bear a subsidy that's about 100% of the cost. The FCC is bent on removing that, and they're not looking for ways of replace subsidies, which means that local carriers in aggregate could be losing $10 billion to $20 billion in revenue streams in subsidies that are being used to maintain and develop the network. If those funds are allowed to go away, that could put the LECs or network in jeopardy. We'll see a lack of oversight and maintenance.

How would this play out?

LECs will put money where the competition is, but because of scarcity of capital and funds, ... other parts of the network [will suffer]. We're already seeing it, for example, in some U S West territories: the carrier is concentrating more on metropolitan areas than rural parts of Colorado and other states. We hear reports that there's been a huge amount of customer complaints and ... held orders.

What will happen with LNP?

It's estimated to cost each Bell operating company $600 million; and GTE would also pay $600 million to $700 million. United/Sprint will also do it. So you add it all up, and it's a huge bill. The FCC has not put in place any cost-recovery mechanism for the BOCs.

When you begin to add up the lost subsidy dollars of approximately $20 billion, the added costs of interconnection, which have got to be immense for each company, become liabilities for local incumbents. This puts a strain on the local network, detracting monies from normal maintenance and provisioning. Almost everything to do with provisioning and billing ... has to be based on these new negotiations. I don't know what they can salvage; it's got to be an immense price.

What's the solution?

In the long run, competition will benefit society, but mandated rules to make this all work under extremely intense time constraints are costly. A normal market ... would develop at its own pace. The immense cost is already beginning to show up at MCI and AT&T. Why do you think AT&T has taken some missteps in local service? [It's] trying to enter into a market where rates are subsidized and where there's no margin ... to go after.

In addition, the network is complicated and expensive to build. Under divestiture, AT&T was never prevented from going into local service; rather, [LECs] were banned from doing long distance. Why didn't AT&T enter the local market? There were no margins even then, and they didn't want to make the LECs mad. Western Electric was so lucrative that [AT&T didn't want to spoil a good thing.] Now ... the regulators are trying to force [another phase of competition]. It's very unnatural for the market.

THE RISK MANAGER: BARBARA REAGOR, SENIOR DIRECTOR OF DISASTER MANAGEMENT AND NETWORK INTEGRITY SERVICES AT BELLCORE

Have you assessed the added risk of outages or vulnerability as a result of the coming era of LNP?

We did a study for Southwest Bell [sic] and provided it to the FCC. We found the risk of a major failure in the network will increase, and that resulted in moving the time scale back for implementation. In effect, LNP was delayed six months as a result of the study. But in our risk assessment, Bellcore found that the network has 35% greater chance of experiencing a major [common channel signaling] outage [as a result of LNP]. An outage in the SS7 network could take out an entire city for several hours.

What problems have you seen?

Fiber cuts are one; we've also seen bombings, hurricanes, floodings, tornadoes and forest fire. Mother Nature kept us busy this past year. We had tornadoes hitting [COs] in Texas and Arkansas. Two or three blocks from the

Channell Enclosures

Designed the way *you* want them!

From copper, to coax, to fiber applications...Channell can design enclosures the way *you* want them.

- Full line of active/passive pedestal enclosures and accessories
- HDC™ covers provide excellent heat dissipation performance
- Rugged designs featuring a wide range of colors and security locking options
- Flexible in design and equipped for high volume production

Channell knows the broadband telecommunications enclosure business. Our extensive line of enclosure products—supported by a strong design team and high capacity manufacturing operation—allows us to give excellent service to network providers as a single source supplier partner.

We are especially well equipped to support all of the unique enclosure requirements of system OEM's.

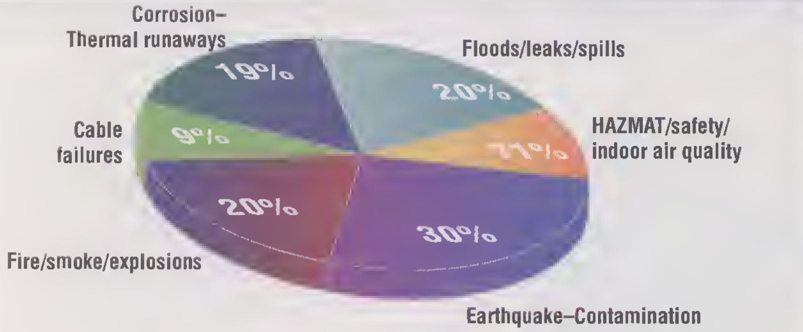
Contact us today for complete information.

CHANNELL
COMMERCIAL CORPORATION

U.S.A.	800/423-1863 909/694-9160 • Fax: 909/694-9170
CANADA	800/387-8332 905/567-6751 • Fax: 905/567-6756
U.K.	44 1753 530789 • Fax: 44 1753 530822
Web Site	www.channellcomm.com

Circle # 112

What causes network disasters



Source: Bellcore

Oklahoma City bombing, a CO—a five-story brick building—imploded. With Hurricane Andrew, certain outside plant modules couldn't withstand the wind, and the bolts broke or were blown over with cables attached. This caused Bellcore to enhance the requirements for the equipment, aiming at more robustness to help vendors make a better bolt. Each disaster spurs us to suggest changes in design to make sure equipment is survivable.

How many outages have occurred since 1992, when FCC mandated that a database be maintained?

Nine-hundred seventy-two reportable outages. Today, we're seeing differences in the types of outages due to Internet usage. In one instance, too many people called up a [CO] and it couldn't hold up—traffic overloaded a switch and an entire office went off line in California.

What would happen today if we had another fire on the scale of a Hinsdale, Ill.? It affected 285,000 calls per hour, and took out the long distance portion of the network for three days.

A Hinsdale fire today would have an even larger [and more catastrophic] impact than before, because communications is business—it's everything. We're putting a lot of data traffic on the network, all kinds of bursty traffic. However, [recovery] mechanisms are more sophisticated. Carriers are ... setting up facilities that can reconfigure and recover in minutes. This is known as the *creation of transparent failures.*

Bellcore's Flexcom product is designed for this purpose. In the event of a cable cut, you can reroute the network as you "flex" the network away from the impact area, so long distance, local and intraLATA traffic can be redirected and communications remain intact. An example: At Seafirst Bank in Portland, Ore., a fiber cut affected service. But the network was flexed by pushing a button in a control center, and the network bypassed the fiber cut and reconfigured the network in 20 minutes.

Is the signaling network weaker or stronger than it was a decade ago?

Stronger. We're much better off and more protected because of Sonet and SS7—particularly the redundancy that's been introduced.

Are there any negative aspects?

To be redundant nationwide, you have to know the pieces of the network you're buying and burying. In the case of fiber routes, many of them lie next to each other. With competition and unbundling, we're in danger of losing the knowledge of where the diversity is. If I'm in business, I need certification that I have a viable diverse route.

THE SONET SAVIORS: DAVID BEEBE, SENIOR MANAGER OF TECHNICAL MARKETING, AND JEFF ROSS, DIRECTOR OF NETWORK PLANNING AT FUJITSU NETWORK COMMUNICATIONS

What changes have happened to Sonet to make the rings more reliable and flexible?

A lot of Sonet customers have been driving us to add ATM equipment into their networks. Given some additional synergies, and the natural survivability of Sonet traffic, we're starting to feel

continued on page 38

Channell's Sealed Plant Enclosures...

Airtight, Watertight & Re-enterable!

Channell's sealed plant enclosures provide complete protection from severe hostile environments for both splicing and termination applications. They're available in numerous sizes and configurations for above or below grade applications.

For a dry solution to your copper, coax and fiber installations, rely on Channell.

Call today for complete information.

CHANNELL
COMMERCIAL CORPORATION

U.S.A. 800/423-1863
909/694-9160 • Fax: 909/694-9170
CANADA 800/387-8332
905/567-6751 • Fax: 905/567-6756
U.K. 44 1753 530789 • Fax: 44 1753 530822
www.channell.comm.com

Circle # 113

transaction no. 00367901157
LOGGED SECURED AUTHORIZED BILLED
IF TOM WRIGHT'S PHONE COMPANY MADE THE MOST OF ITS CUSTOMER DATA, IT WOULD LEARN

LIKE HIS NEED FOR A NEW PHONE COMPANY.

Not every phone company knows its customers like Ameritech does. To better understand and interpret customer information spread over multiple locations and databases, they recently turned to Tandem's Decision Support Solutions. The results were nothing short of remarkable. In less than three months, Ameritech gained valuable insight into customer usage patterns. This helped them offer improved calling plans, retain more customers, and most importantly, increase profits. In fact, they completely recouped their investment in Tandem's proven technology within six months. Tandem® solutions are available on our traditional S-series NonStop® Himalaya® and Integrity® UNIX® system–based servers as well as Microsoft® Windows NT® Server–based solutions, ensuring integration and choice for every customer. Get to know us a little better by visiting our Web site at www.tandem.com or call 1-800-NONSTOP, ext. 8021 for more information.

Every second, every transaction, every customer counts.

TANDEM®
reliability, no limits.

Circle 114

continued from page 35

The network is much more robust, thanks to protection switching technologies.
—Jeff Ross, Fujistu Network Communications

more confident in adding ATM features. Our Fastlane product provides cell relay with LAN interfaces. We've basically taken Sonet boxes and adapted them for interconnecting Ethernet, Token Ring or ATM user networks through Sonet wide-area services.

Have you taken any extraordinary redundancy or safety precautions to ensure reliability?

We're still reinforcing protecting switching capability—i.e., protecting rings through Sonet DACs. Such features as protection schemes [and] forward error correction are things that IXCs traditionally needed for their products.

Some of the bandwidth in the Sonet ring should be set aside for bursty data—Ethernet/Token Ring, STS-1, for example. So we take the remaining channels in the OC-3 Sonet ring and have them carry STM traffic. The technology allows us to carry ATM [data] traffic and voice traffic into separate streams. Data traffic such as Ethernet or Token Ring can be taken on the DS-3 UNI and mapped to an STS-1. Before, people couldn't get over the traditional mapping of Sonet for data. This allows 10 or 12 sites to share STS bandwidth and accommodate the bursty nature of data along a common pipe.

But this is really an issue of efficiency, not reliability.

The Factr system integrates access and Sonet transport, eliminating the need for separate pieces of equipment. Another product does remote memory backup, copying from Factr the provisioning database and storing it. [This can be vital in disaster scenarios, they claim.] For example, within the last year, one of our customer's COs was nailed—a storm hit our multiplexers [and] one had to be dried with a hair dryer. The capability helped relocate the ID and get the network elements reestablished. It recreated a backup of the remote provisioning database, which was stored on tape, and then downloaded to a new system. This kind of capability allows restoration in the event of catastrophic failures, such as the Hinsdales, a tornado or major earthquake. There's a lot of built-in redundancy with Sonet. If you can diversify your network management centers and monitor your database, you can still put your network back together even after a disaster.

So the network is stronger and less vulnerable than before?

The technology to support the network is better. When a fiber dig-up occurs on one of our rings, right there on Windows95 the ring can be rerouted and everything self-healed. During a Bell South cable dig-up, we didn't even know how the restoration worked, exactly. We know the traffic goes both ways on the ring, so it can be restored quickly.

The technology is there to form an incredibly robust network from the transmission technology side. Remote memory backup is part of that, but software hasn't reached the level of overall reliability that much of the hardware has. Overall, though, the network is much more robust due to protection switching.

THE INDUSTRY WATCHDOG: ALLAN JONES, ASSOCIATE DIRECTOR OF NETWORK OPERATIONS AT PACIFIC BELL AND MODERATOR OF THE NETWORK INTERCONNECTION INTEROPERABILITY FORUM FOR ATIS

What kinds of testing will ATIS conduct to ensure network reliability?

We're looking at issues associated with [LNP]. We've just come to closure on a document which outlines tests that need to be performed for interconnecting companies. The tests are restricted to interconnection, not services; what companies do within their own network is their own business.

How do you ensure the integrity of the interconnected network?

By designing requirements for turn up testing, so that if we do have problems, we know whom to contact. These processes are focused between companies.

How does this impact LNP?

Our biggest challenge with LNP is that there are so many new players, and some of the players are new in terms of providing local service; we're then coming into the market having a greater chance of the network degrading.

Consider two cars on a five-lane freeway; there is not much chance of getting into an accident. But that's not true with hundreds of thousands of 'cars'; the chance of network failures naturally are increasing. Even though companies engaged in providing telephone service are aiming for the highest quality and reliability, the NRIC has found an increase in network outages. However, for those networks in place, performance has improved, and LNP may not have an initial impact.

What about the Bellcore study indicating a significantly increased risk of major outage due to an overly fast introduction of LNP databases?

I wouldn't dispute Bellcore's observation about a statistical chance for outage; there are no guarantees saying we won't have an outage, and there are no guarantees saying we will; I'm confident that the people involved will do LNP implementations well.

What about the dangers of Internet traffic?

The networks are holding up; there's been some question as to the size of switches, and the amount of lines that are required on trunking arrangements. But we've already had a big boom in the quantity of calls hitting the switch, and people are staying on line longer than switching was designed for. We could experience a degradation, but they're handling it right now; it's a kudo for the phone companies. When you see this quantity of traffic out there, for the vast majority of cases, it's going along fine. ■

LOW-SPEED DATA MODULES
support RS-232, RS-422, RS-449 and V.35 protocols which enables SONETLYNX to support a wide range of customer applications

FULL-BANDWIDTH T1 INTERFACES
(async or byte-sync) can add/drop connections in a single shelf for more channels per site without the added cost of extra shelves, optics or rack space

INTEGRATED DS0 GROOMING
eliminates the need for external channel banks and can even eliminate the need for digital cross connects to further reduce costs and improve reliability

MULTIPORT ETHERNET BRIDGE
interface supports 64 LANs with up to full 10 Mbps connections without external LAN bridge equipment

EXCLUSIVE VIDEO ARCHITECTURE
(patent pending) integrates a digital video CODEC and uses a fraction of the bandwidth of traditional products while eliminating external video matrix switches

SINGLE NETWORK MANAGEMENT SYSTEM
manages voice, data, LAN and video traffic to eliminate the costs of multiple, separate management interfaces

Out-Of-The-Box Thinking. All In One Box.

SONETLYNX™ PACKS MORE INTO OUR MUX SO YOU GET MORE OUT OF IT. That's because the Intelect Network Technologies team who created SONETLYNX designed it to go far beyond the scope of traditional fiber-optic multiplexers. It delivers all the capabilities and advantages of multimedia communications in a single equipment platform. SONETLYNX's single network architecture and flexible configuration design supports multiple voice, data, network and video protocols and integrates the functions of external equipment required by other solutions. That means higher performance and lower costs - both up-front and long-term.

Even better, Intelect made all of this innovative thinking fully SONET compliant, supporting industry standards for both fiber-optic and copper network infrastructures. Configurable redundancy, hot swappable modules and extended temperature operation ensure reliability under even the toughest conditions. Add in modular growth, remote provisioning and maintenance plus an integrated, single network management system, and you'll see that SONETLYNX really is the one multiplexer that has it all.

To receive a free interactive CD that includes a virtual reality tour of SONETLYNX, call us at 1-888-477-7272 or visit our website at www.intelectinc.com.

Intelect
Network
Technologies

SEE WHAT HAPPENS WHEN YOU THINK OUTSIDE THE BOX?

Circle 115

BROADBAND Notebook

ARIELLE EMMETT

HP focusing on critical server suites

Hewlett Packard is again focusing on mission-critical server suites with three foundation configurations that carry a 99.95% annual uptime guarantee. The configurations span the HP 9000 Enterprise Server hardware, operating system, internode connectivity and high-availability storage. These configurations are designed for customers implementing enterprise resource planning (ERP) or business process re-engineering solutions in which platform availability and high capacity are main priorities.

The platforms are centered on a new V-class HP 9000 line of commercial Unix servers. The company's telecommunications systems business unit provides wireline, wireless and cable industries with a range of solutions, including computer systems, design and analysis tools, network monitoring, test equipment, consulting and service.

To ensure application availability, the mission-critical server suites use HP's robust HP-UX 10.20 OS, historically ranked as the highest in reliability when compared with other Unix operating systems as a foundation. Combined with high availability middleware, including MC/ServiceGuard, MirrorDisk/UX, Online JFS and GlancePlus, the suites include optional add-ons, such as the HP cluster-manager workstation with Network Node Manager and ClusterView, Process Resource Manager, UPS and disks for standby systems. Included in the configurations price are HP's critical systems support and consulting.

WorldWind Takes Ventura County

This summer GTE Media Ventures introduced its WorldWind cable modem service to Ventura County, Calif. The company says it will bring cable modem services and americast video services at 'warp speed access' to 40,000 residential and business customers by year-end.

The technology provides speeds 78 times faster than ISDN and 350 times faster than a 28.8 kbps modem over the regular telephone network.

GTE says its new cable modem service offers the same bandwidth in upstream and downstream paths, permitting more sophisticated applications such as high-quality desktop video conferencing and Internet access for business customers.

Access module nets Euro mark

Larscom Inc. has completed testing and is compliant with the European Telecom Directive product standards, called CE Marking, for its Orion 4000 T3Clear data access module. Larscom claims the module is the only WAN access solution on the market that can transport data, voice and ATM over a single clear-channel DS3 circuit. Obtaining the CE Mark is a mandatory requirement for this type of product to be sold in 15 European countries without any further in-country testing.

"Over the past several months, we have learned that a number of our customers either are considering deploying or have deployed DS3s in Europe and across the Atlantic, due to DS3 circuits higher bandwidth, greater availability and lower cost than alternative services," says Maurice Levitt, product manager for Larscom. "We aggressively pursued the CE mark for T3Clear so that we could meet those customers' requirements."

Hot optical properties

Rajiv Ramaswami, director of the Tellabs Optical Networking Group (Hawthorne, N.Y.), received the prestigious W.R.G. Baker Prize Award from Institute of Electrical and Electronic Engineers (IEEE) for a paper about WDM. Entitled "Routing and Wavelength Assignments in All-Optical Networks," the paper appeared in IEEE/ACM Transactions on Networking in October 1995.

Earlier this year, Tellabs acquired certain wave division multiplexing and optical network technologies and talents from IBM. Ramaswami, formerly an IBM Research Center scientist who now is director of the Tellabs Optical Network Group, led an IBM team to develop an early commercial 20-wavelength optical fiber transmission system. He continues research on WDM for Tellabs.

Cox builds multiservice net

Tellabs (Lisle, Ill.) announced in early September that it is supplying its Sonet-based Titan 5500 digital cross-connect system to Cox Communications. The CATV company reportedly will use the Titan system throughout its nationwide network, according to Tellabs sources.

Cox is building a multiservice network to deliver voice and data services in select markets, and is beginning to deploy local exchange service to businesses and residents in three markets. Initially, Cox plans to target shared-tenant facilities, such as apartment and condominium complexes in Southern California. Commercial business service will be offered in Hampton Roads, Va., and Oklahoma City.

"We are going to offer a vast array of advanced telecommunications services," says Mark Davis, director of engineering for Cox. "We plan to package telephony, high-speed Internet access and video together." According to the deal, which is estimated at $5 million, Tellabs becomes Cox's exclusive source for Sonet 3/1 digital cross-connect systems, which will be used to provide a Sonet transport network that connects Cox's hybrid fiber/coax customer access network to central office-based switching resources. The Titan systems will groom DS1 traffic from the access network to the Sonet fiber ring at distribution hubs where the traffic will be combined with traffic from other hubs before connecting to the switch.

The Titan can be directly connected to multiple fiber rings, which simplifies surveillance and provisioning of other transport elements, including add/drop and terminal multiplexers, connected to the fiber ring. Thus, competitive local exchange carriers like Cox can reduce expenses associated with managing transport equipment from multiple vendors, according to Tellabs sources.

Want To Add Zip To Your Network Deliveries?

Catch This Pitch.

With RELTEC's innovative access solutions, you'll be delivering just the right pitches to your customers—lightning fast and straight down the broadband pipe.

Take our Ethernet-based FIBERST★R™ high-speed Internet access solution. It's a hummer—nearly 400 times faster than 28.8Kb/s modems, and 70 times faster than ISDN! By transporting TCP/IP packets over fiber-based systems, FIBERST★R effectively extends an Ethernet LAN into each subscriber's home over a symmetrical, full-duplex, 10Mb/s, 10BaseT connection. You deliver high speed and high reliability at low cost—and users don't consume precious CO switch fabric.

Our repertoire also features Switched Digital Video—seamless, integrated ATM-based interactive service delivery to subscribers over a Fiber-to-the-Curb (FTTC) distribution architecture. Our FiberCast™ analog and digital broadcast video can be merged with narrowband, wideband and broadband ATM traffic at the HDT and transported to the ONU—over the same fiber link.

FIBERST★R high-speed Internet access. Switched Digital Video. FiberCast analog and digital broadcast video. A potent line-up that empowers your network and positions you to cover all the bases in meeting your customer needs.

Visit Us at **NFOEC '97**, Booth #115

To learn more about RELTEC's advanced network solutions, FAX your name, company, interest area and telephone number to us at **1-800-800-1280** today.

Circle 116

RELTEC™

RICK MUSCOPLAT

The river ran through it

Premises jacks and demarcation blocks filled with sewage, salt, solvents, rotting food, and cattle feed. Only one jack consistently produced dial tone.

WHEN THE 500-YEAR FLOOD HIT GRAND FORKS, N.D., IN EARLY 1997, IT WAS NOT JUST ABOUT RIVER WATER INVADING A SECTION OF TOWN. IT WAS ABOUT AN ANGRY RIVER THAT TOOK ON THE ENTIRE CITY, SUBURBS AND SURROUNDING COMMUNITIES, REFUSING TO BE HELD IN PLACE BY SOMETHING AS TRIVIAL AS A WALL OF SANDBAGS.

THE RIVER CLAIMED VICTORY OVER HOMES, BUSINESSES AND CITY OFFICES. BUT THERE'S ONE THING THE RIVER DIDN'T GET: ITS CHANCE TO DECLARE VICTORY OVER THE TELECOMMUNICATIONS NETWORK. VITAL COMMUNICATIONS STAYED UP AND RUNNING DURING THE ENTIRE FLOOD, ENABLING FIRE, RESCUE, PUBLIC SAFETY, AND DISASTER OFFICIALS TO DO THE JOBS THEY HAD TO DO.

After the floodwaters receded many phones had dial tone, while others didn't. This is the story of how some very smart long-term planning, including the installation of gel-filled premises jacks and demarcation boxes, crystal-clear communications for thousands of homes and businesses.

Although the floodwaters were bad enough, far worse was what this river brought with it. The Red River floodwater arrived in Grand Forks before the spring rains had a chance to cleanse the landscape. When the water swept across roads, it soaked up excessive road salt from three years worth of brutal winter weather. Water swirled around farmers' vacant fields, absorbing herbicides, insecticides and animal manure. It swallowed bulging stores of fertilizer and feed. It ruptured sanitary sewer lines and popped oil and gasoline tanks from their cozy underground nests, its force breaking the cement slabs above them. Meanwhile, home refrigerators, without power, turned meat, chicken, and fish into award-winning science experiments. As the floodwaters reached stove height, the refrigerators floated like fishing bobbers, eventually rolling around and dumping their furry innards into the nightmare. There the river sat for two weeks, soaking into telephone jacks in the basement, first floor and second floors of homes and businesses.

U S West struggled day and night to keep its central office switch dry and operable. Loren Fritz, U S West director of service assurance, tells the story: "The basement of our building in Grand Forks was filling with water. Denny Braaten, U S West central office manager in Grand Forks, and his staff performed miracles. They welded shut the door that goes to the basement and then inserted two 4-inch diameter hoses through them and down into the water. The bilge pumps couldn't keep up. So they called the U.S. Air Force base just outside of Grand Forks and borrowed its 6-inch diameter pump. All three pumps ran 24 hours a day throughout the entire event. The switch remained dry.

While the waters may have receded, more problems were about to appear. It was as though the whole town had been "slimed," ready for the filming of the next "Ghostbusters" sequel. Unfortunately, this wasn't Hollywood make-believe. Officials worried about the effects of flood waste on public health. And it threatened to stop telecommunications in the entire region.

Years earlier, U S West had instituted a "sealed-plant" policy, requiring watertight connections at every point of entry. That was fine for overhead and underground cabling, but what about premises connections such as wall jacks and demarcation boxes? U S West had no control over the connections customers had made past the demarcation point. Unfortunately, many customers had purchased the least expensive jack they could find—without even checking to see if the jack met FCC Part 68—an action that would prove to be a costly mistake.

U S West, like most regional Bell operating companies (RBOCs), offers line-maintenance plans to its residential customers. Having a vested interest in keeping service calls to a minimum, U S West had been field testing a gel-filled jack for several years. The decision to install a gel-filled jack was left to the discretion of the individual installer.

FOR WHOM THE GEL TOLLS

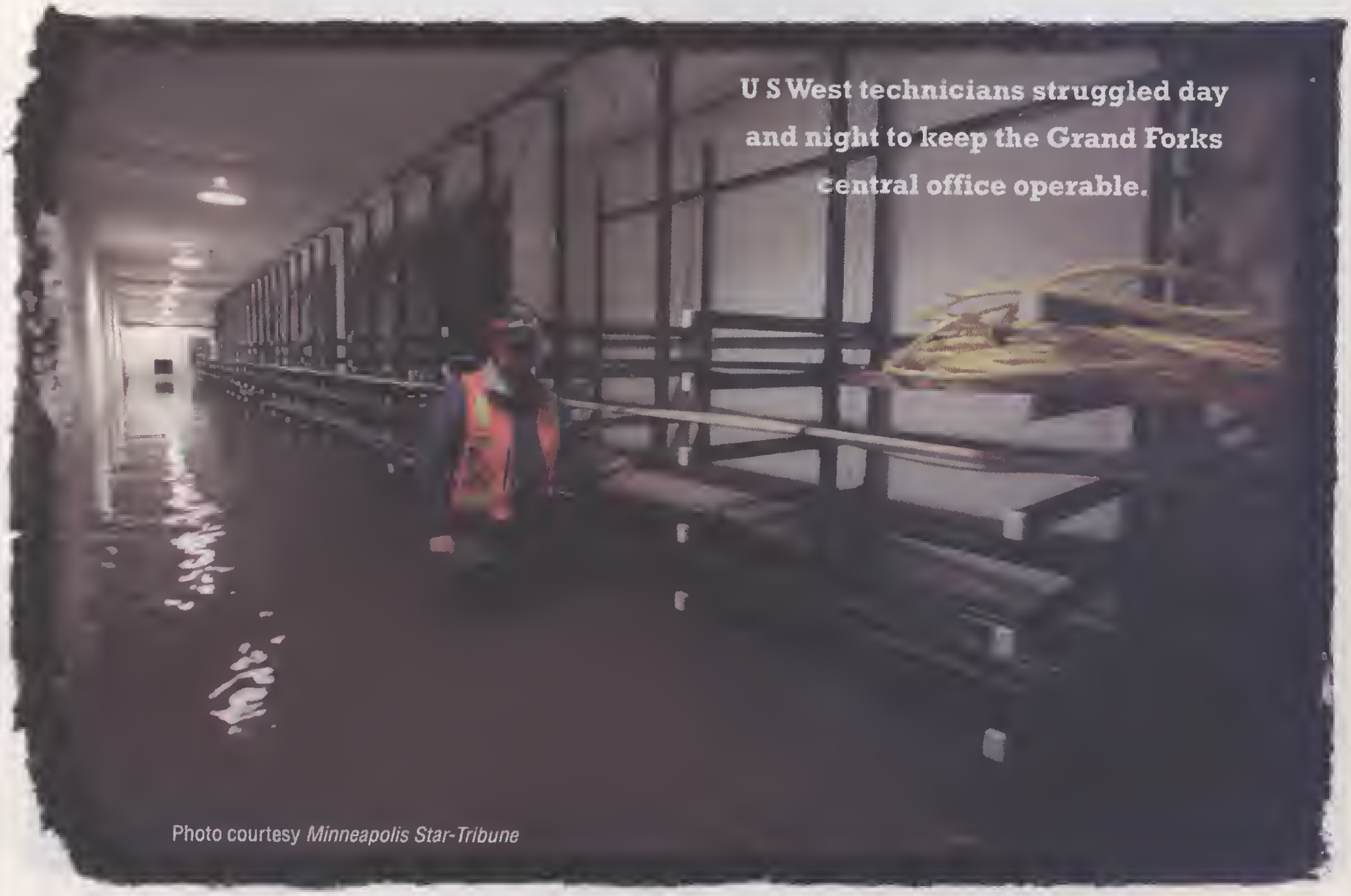
The RJ-11 modular jack has an interesting history. First field-tested in 1968 in Chicago by the then-Bell Laboratories, the modular jack proliferated throughout the Bell System. However, in some areas, the jacks were costing a fortune to maintain. In those areas, the ratio of new jacks purchased to new lines installed was as high as 10:1. The problem? Corrosion, which was in some cases, causing failure in as little as one week. Bellcore re-examined the specifications for the gold spring-wire inside the jacks and eventually modified them slightly.

But it was time to think about factors other than the gold-plating. After all, gold is inert—it can't corrode. But the base spring-wire material is not gold; it is a combination of nickel, brass or bronze which is gold-plated and then crimp-connected to a copper lead wire. When dissimilar metals come into contact with moisture, galvanic action and corrosion can occur. The corrosion causes the gold plating to rupture, which accelerates the corrosion process.

Bellcore scientists searched for a way to seal the jack from moisture. At the same time, BellSouth was approaching independent vendors to make a sealing agent that would remain in the jack. The sealant also had to be non-toxic, in case a customer removed the jack. Bellcore and BellSouth searched for a jack manufacturer to join the effort. The two companies found the right formula for the sealing gel and a manufacturer to build the jacks; Bellcore then wrote the TR-1334 specification.

MEANWHILE, BACK AT THE FORK

When it was safe to enter Grand Forks, Fritz, along with Jerry Begley, director of provisioning and network and technology services and 28 other managers



U S West technicians struggled day and night to keep the Grand Forks central office operable.

Photo courtesy *Minneapolis Star-Tribune* from U S West's regional communications center in Plymouth, headed north. Fritz and Begley had seen their share of natural disasters—fires, tornadoes and floods—so they were expecting the worst. They had been warned about the conditions and came equipped with boots, orange vests, gloves and plenty of disinfectant soap. One of the first team members to arrive at the scene stepped out of her vehicle and immediately lost her footing on the slimy pavement. The others were warned. This was the worst Fritz and Begley had ever seen. Everything that was once white, was now gray. The entire town needed a high-pressure (clear water) washdown.

U S West dubbed its team, "Feet on the Street." The team's immediate goal was to establish dial tone, house by house. One team member divided the city into quadrants, off they went, knocking on doors, asking the residents if they had telephone service.

"What we discovered was simply amazing," says Fritz. "In every case where the installer had used a gel-filled jack, we had crisp, clean dial tone." There were many instances where U S West personnel found dial tone at gel-filled demarcation jacks that were still filled with sewage. Some customers were tossing out their non-working phones and plugging new phones into old gel-filled jacks and getting instant dial tone.

> **'In every case where the installer had used a gel-filled jack, we had crisp, clean dial tone.'**
>
> **—Loren Fritz, CO manager**

The results from non-filled jacks were pretty dismal in comparison. "Either we had no dial tone, or static so bad you couldn't hold a conversation," says Begley.

Communications in the days after the flood was critical. Before the electric utility would restore power to a home, the resident had to have the home inspected by a licensed electrician. How do you contact an electrician when your phone system has been underwater? It was no problem for those customers whose homes were wired with the gel-filled jacks. In fact, Fritz and Begley encountered line-maintenance contract customers who told them, "I don't need you. My phone's working fine. It's the electrician I can't get a hold of. Can you help me with that?" Those were the customers who had been wired with gel-filled jacks. Obviously, they were oblivious to that fact and had just taken their phone service for granted—the way it's supposed to be.

In a shopping center on the edge of town, U S West had recently upgraded all the businesses to sealed-plant status, including the installation of gel-filled jacks in every location. In every case, those businesses had static-free telecommunications. They were able to

TURN KEY SOLUTIONS

for all your fiber, copper, and coaxial needs

- Engineering
- Installation
- Splicing
- Testing
- Maintenance
- Material Purchase

NETWORK CONSTRUCTION CS.

4019 Viewmont Drive
Greensboro, N.C. 27406
(910) 855-3950
Fax: (910) 292-7560

Serving you with eight locations nationwide

Circle # 117

America's Network

FAST ACTION POSTCARD DECK

A highly targeted and cost-efficient direct response card deck reaching over 50,000 decision makers throughout the new public network!

CONVENIENT & EASY TO USE— IDEAL FOR:

- Generating sales leads
- Distributing special offers
- Testing product ideas
- Testing price points
- Promoting new or existing products and services
- Inviting attendees to trade shows, seminars, conferences

America's Network handles all the details — printing, mailing and outgoing postage. Each card in the deck is self-contained, featuring your ad on one side and your business reply address on the other. Leads are mailed directly to you for immediate sales follow-up. It's that easy and convenient!

For Complete Card Deck Information Contact:

DENISE ADKINS-KOKAI,
ADVANSTAR MARKETING SERVICES
1-800-225-4569 EXT. 163
216-891-3163 ♦ FAX: 216-826-2865

DECK MAILS:
MARCH ♦ MAY ♦ OCTOBER

Reader Service Card

America's Network

Do you wish to receive (continue to receive) *America's Network* FREE of charge? ☐ Yes ☐ No

SIGNATURE ______________________ DATE __________

NAME ______________________ TITLE __________

COMPANY ______________________

DELIVERY ADDRESS ______________________

CITY ______________________ STATE/PROVINCE __________

ZIP/POSTCODE ______________________ COUNTRY __________

PHONE ______________________ FAX __________

INTERNET/E-MAIL ______________________

To qualify for your FREE subscription, you must answer these FOUR questions: *(Fill in oval completely, as shown: ●)*

1. What is the primary business activity of your firm? *(Fill in **ONE** only.)*

1 ○ 100 Telecommunications Carrier/Network Service Provider/Holding Co.
2 ○ 525 Utility
3 ○ 575 Computer Service Firm/Software Developer or Other Computer/Electronic-Related Industries
4 ○ 145 Telecommunications Consulting/Engineering Co.
5 ○ 135 Construction Contractor
6 ○ 152 Telecommunications Equipment Vendor, Reseller, VAR or Distributor
7 ○ 500 Finance/Investment/Banking
8 ○ 600 Corporate/Private/Government Telecommunications User
9 ○ 625 Association
10 ○ 400 Other ______________ *(please specify)*

We reserve the right to reject any incomplete or unqualified requests.

2. Which of the following services does your co. provide? *(Fill in **ALL** that apply.)*

11 ○ A Interexchange Carrier/Long-Distance Service Provider
12 ○ B Local Exchange Carrier
13 ○ C Cellular Carrier
14 ○ D PCS Operator
15 ○ E Paging & Message
16 ○ F Satellite Communications
17 ○ G Other Wireless Operator
18 ○ H MSO (Two or more Cable TV Systems)
19 ○ I Independent Cable TV System
20 ○ J Cable TV Contractor/Engineering Firm
21 ○ K Other Cable
22 ○ L Competitive Access Provider (CAP)
23 ○ M Telecommunications Reseller
24 ○ N Internet Service Provider/Commercial Online Service Co.
25 ○ O Systems Integration/Outsourcing
26 ○ P Other Carrier
27 ○ O OTHER ______________ *(please specify)*

3. Which of the following describes your title classification? *(Fill in **ONE** only.)*

28 ○ 11 **Technical Mgmt.** (Engineering VP, Director or Mgr.; Technical VP, Director or Mgr.; Network VP, Director or Mgr.; Plant Mgr.)
29 ○ 12 **Engineering** (Network Designer, Engineer, Technician)
30 ○ 25 **Data Communications/Digital/IS/MIS Mgmt.** (Data Communications, Digital, I/S VP, Director or Mgr.)
31 ○ 13 **Mgmt.** (VP, General Mgr., System Mgr., Mgr., Director)
32 ○ 3 **Corporate Mgmt.** (Chairman, Owner, President, Partner, Executive/Senior VP/Director, Treasurer, CFO, COO)
33 ○ 4 **Legal, Financial, Regulatory or Processing Services** (Director or Mgr. of Rate Planning & Administration, Service Costs, Methods)
34 ○ 5 **Personnel & Administrative Services** (Director or Mgr. of Training, Safety, Security, Buildings & Land, Supplies & Distribution)
35 ○ 16 **Sales/Marketing** (Sales or Marketing VP, Director, Mgr., Representative)
36 ○ 20 **Purchasing** (Purchasing, Materials, Contract VP, Director or Mgr.)
37 ○ 7 **Other** (Co. Copies and Other Titled and Non-Titled Personnel)

FAST ACTION FAX: 1-413-637-4343

Free subscription offer valid in the U.S., its possessions, and Canada only. Mexico (24 issues) $64. All other countries (24 issues) $84.
☐ Add $90 per order for airmail delivery. Payable in U.S. dollars drawn on a U.S. bank.

To receive FREE information on products and services advertised in this issue, circle the appropriate numbers below.

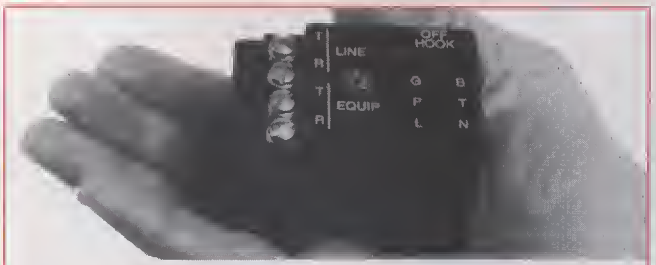
100	101	102	103	104	105	106	107	108	109	110	111	112
113	114	115	116	117	118	119	120	121	122	123	124	125
126	127	128	129	130	131	132	133	134	135	136	137	138
139	140	141	142	143	144	145	146	147	148	149	159	151
152	153	154	155	156	157	158	159	160	161	162	163	164
165	166	167	168	169	170	171	172	173	174	175	176	177
178	179	180	181	182	183	184	185	186	187	188	189	190
191	192	193	194	195	196	197	198	199	200	201	202	203
204	205	206	207	208	209	210	211	212	213	214	215	216
217	218	219	220	221	222	223	224	225	226	227	228	229
230	231	232	233	234	235	236	237	238	239	240	241	242
243	244	245	246	247	248	249	250	251	252	253	254	255
256	257	258	259	260	261	262	263	264	265	266	267	268
269	270	271	272	273	274	275	276	277	278	279	280	281
282	283	284	285	286	287	288	289	290	291	292	293	294
295	296	297	298	299	300	301	302	303	304	305	306	307

4. Which of the follow equipment/services do you purchase, recommend, specify, approve or otherwise influence the purchase of? *(Fill in **ALL** that apply.)*

38 ○ A **Wireless/Cellular/Mobile/PCS Equip./Services**
39 ○ B **Central Office Equip./Services** (CO Switching Equip. [digital, ATM], Programmable Switches, Operations Support Systems, Workstations, CO Test, Hardware, Frames)
40 ○ C **Transmission and Broadband Distribution Equip./Services** (Digital Loop Carriers, Sonet, T1, Microwave, Satellites, Digital Cross Connects, Amplifiers, Passives, Cable, Long Haul Transmission Systems, Loop Distribution and Electronic Systems, Multiplexers)
41 ○ D **Cable/Video/Multimedia Equip./Services** (Headend Equip., Antennas, Switches, Receivers, Studio Equip., Audio Processors, Fiber/Coax Systems, Network Mgmt., Video Servers, Video Operations Support Systems, Set Top Equip.)
42 ○ E **Customer Premises, Broadband Subscriber Equip./Services** (PBXs, Station Equip., ACDs, Videoconferencing, Remote Controls, Converters)
43 ○ F **Outside Plant and Construction Equip./Services** (Pedestals, Vehicles, Towers, Tools, Enclosures)
44 ○ G **Data Communications/MIS/Network Mgmt. Support Equip./ Services** (including LANs, WANs, & Network Software)
45 ○ H **Power & Protection**
46 ○ I **Test & Measurement**
47 ○ J **Other** *(please specify)* ______________
48 ○ K None of the Above (A–J)

This card is good for 3 months from date of issue.
SEPTEMBER 15, 1997

1



Subscriber-Premises Line Conditioner

Our new TurboAmp™ 2-wire line powered amplifier makes line conditioning at the subscriber end a snap. No more conditioning special circuits from the central office. With the TurboAmp™, you can turn POTs into premium lines with the press of a button.

The TurboAmp™ amplifier *offers:*

- Easy premises installation
- Higher data rates and through-put
- Automatic gain and equalization alignment
- Same day installation
- Low cost
- Optional loop back / remote alignment

For more information, call 800-222-1898.

Wilcom, Inc.

PO Box 508 • Laconia, NH 03247
800-222-1898 • (603) 524-2622 • Fax (603) 524-3735

Circle # 118 http://www.wilcominc.com

PCS

LIGHTWEIGHT CHAMP

The building materials used in PSI's L.E. Hut™ Enclosures are designed to give you the best of both worlds: light weight and durability. The floor, for example, is made of a special fiber-reinforced concrete material which is just as durable as poured concrete but substantially lighter. That gives you the economy of lightweight shipping and installation.

PSI offers fast delivery and turnkey services, including EF&I, on shelters and cabinets for telephone, cellular, and power distribution applications. Discover the PSI difference.

PSI

Professional Systems, Inc.
800/542-4422 P.O. Box 560, Hartland, WI 53029
Fax: 414/369-5205

Circle # 119

NO POSTAGE
NECESSARY IF
MAILED IN THE
UNITED STATES

BUSINESS REPLY MAIL

FIRST-CLASS MAIL PERMIT NO 950 PITTSFIELD MA

POSTAGE WILL BE PAID BY ADDRESSEE

America's Network
PO BOX 5100
PITTSFIELD MA 01203-9845
USA

TURN KEY SOLUTIONS

for all your fiber, copper, and coaxial needs

- Engineering
- Installation
- Splicing
- Testing
- Maintenance
- Material Purchase

NETWORK CONSTRUCTION SERVICES

4019 Viewmont Drive
Greensboro, N.C. 27406
(910) 855-3950
Fax: (910) 292-7560

Serving you with eight locations nationwide

Circle # 117

America's Network

FAST ACTION POSTCARD DECK

A highly targeted and cost-efficient direct response card deck reaching over 50,000 decision makers throughout the new public network!

CONVENIENT & EASY TO USE— IDEAL FOR:

- *Generating sales leads*
- *Distributing special offers*
- *Testing product ideas*
- *Testing price points*
- *Promoting new or existing products and services*
- *Inviting attendees to trade shows, seminars, conferences*

America's Network handles all the details — printing, mailing and outgoing postage. Each card in the deck is self-contained, featuring your ad on one side and your business reply address ~~on the other.~~ Leads are mailed directly to you for immediate sales follow-up. It's that easy and convenient!

For Complete Card Deck Information Contact:
DENISE ADKINS-KOKAI,
ADVANSTAR MARKETING SERVICES
1-800-225-4569 EXT. 163
216-891-3163 ♦ FAX: 216-826-2865

DECK MAILS:
MARCH ♦ MAY ♦ OCTOBER

Photo courtesy *Minneapolis Star-Tribune*

With welds, sandbags and bilge pumps, U S West managed to keep equipment dry.

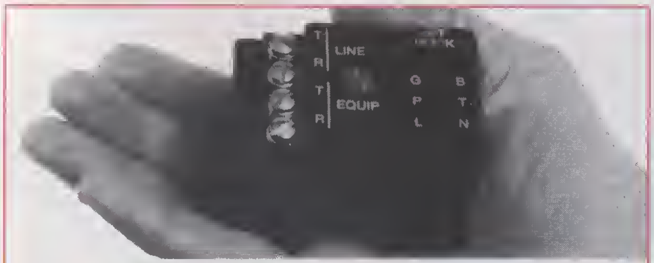
answer the phones, let customers know they were open and had inventory, and were ready for business.

As the days went on and homes started to dry out, the problems worsened. "Corrosion," says Begley. "Salt, fertilizer, cattle feed, sewage—it went to work on those connections, and if we had originally wired the home with non-filled jacks, we just had to toss them."

The gel-filled jacks won the duel with the Red River by doing what they were designed to do—seal the modular plug-spring finger-copper wire to spring finger connection.

NOW WHAT?

What does this mean for service providers? You don't need to be located in a floodplain to be concerned about corrosion in modular jacks. RBOCs, interconnects, cabling contractors, network designers and supervisors alike need to be concerned about corrosion. Bellcore's technical



Subscriber-Premises Line Conditioner

Our new TurboAmp™ 2-wire line powered amplifier makes line conditioning at the subscriber end a snap. No more conditioning special circuits from the central office. With the TurboAmp™, you can turn POTs into premium lines with the press of a button.

The TurboAmp™ amplifier *offers:*

- Easy premises installation
- Higher data rates and through-put
- Automatic gain and equalization alignment
- Same day installation
- Low cost
- Optional loop back / remote alignment

For more information, call 800-222-1898.

Wilcom, Inc.
PO Box 508 • Laconia, NH 03247
800-222-1898 • (603) 524-2622 • Fax (603) 524-3735

Circle # 118 http://www.wilcominc.com

PCS
LIGHTWEIGHT CHAMP

The building materials used in PSI's L.E. Hut™ Enclosures are designed to give you the best of both worlds: light weight and durability. The floor, for example, is made of a special fiber-reinforced concrete material which is just as durable as poured concrete but substantially lighter. That gives you the economy of lightweight shipping and installation.

PSI offers fast delivery and turnkey services, including EF&I, on shelters and cabinets for telephone, cellular, and power distribution applications. Discover the PSI difference.

PSI
Professional Systems, Inc.
800/542-4422 P.O. Box 560, Hartland, WI 53029
Fax: 414/369-5205

Circle # 119

support staff member Ken Moyers helps us understand the physics behind modular jack corrosion.

"If I take two little gold wires, place them .018 to .20 inches apart, put them into a slightly conductive solution, and put 50 volts across them, I can plate gold from one side to the other. The driving force is the 50 volts. So, you can't ever forget that you've always got 48 volts DC at that modular jack, where tip and ring are separated by only .018 to .020 inches. That movement of gold leaves the spring wire wide open for corrosion," he explains.

But electrolytic solution in an office or home environment? Absolutely; most jacks are mounted near the floor, resulting in a temperature difference that invites condensation.

"There is a tendency for moisture to form hydroxl ions and acid when you have a gap between two electrodes," says Moyers. Think about the electrolytic and corrosive effects of the chemicals found in household cleaners, carpet shampoos, commercial cleaners for office surfaces, and off-gassing from plastics. They all act as electrolytes, he adds.

Attaining sealed-plant status is important today with homes and businesses demanding higher data-transfer speeds and highly reliable voice communications. To achieve that level of reliability, the connection between premises wiring and the jack itself should also be of concern. Gel-filled jacks equipped with encapsulant-filled IDC connectors rather than screw terminals—keep moisture away from all connections and prevent it from wicking down the insulation and into the jack. Ordinary station cable can wick moisture at rates of up to 1-foot per day.

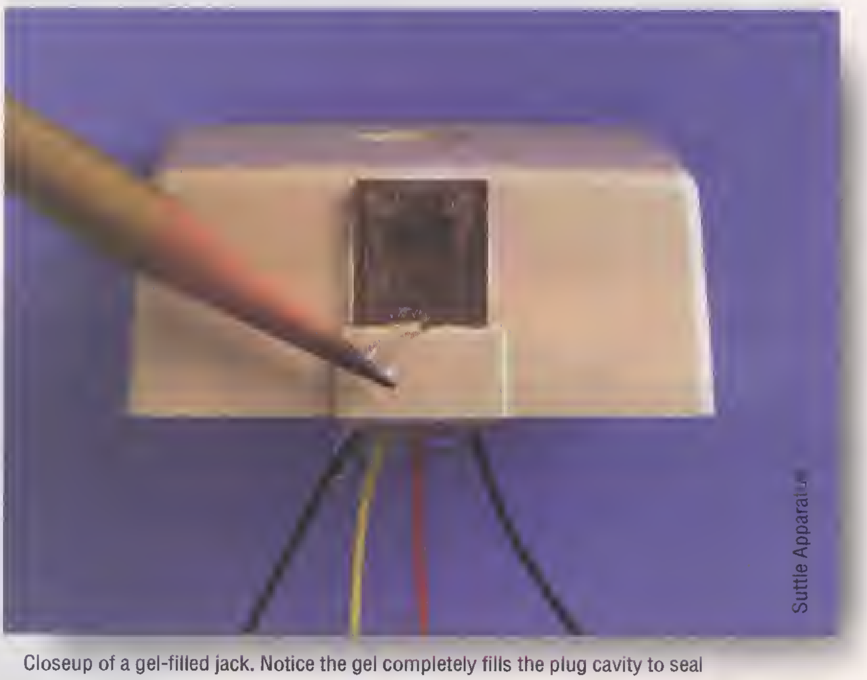
Wicking will be especially important to watch in the coming months and years as Grand Forks dries out. U S West anticipates many more service calls from those installations that are wired with non-gel-filled jacks. Here, extra cost of the gel-filled jack starts to turn into long-term savings. A gel-filled jack is a fraction of the price of a truck roll. Customers who wired their own jacks will have to toss the flood-damaged jack. Worse yet, they may experience continuing episodes of static if they contaminate the new jack with the old modular plug, or do not use encapsulant-filled IDC connectors.

Sealed-plant status is important, with homes and businesses demanding higher data-transfer speeds and highly reliable voice communications.

The issue of retail store jacks not meeting FCC Part 68 standards and the Bellcore TR-1334 are recurring. Installers who are unaware of the critical need to seal premises wiring and the modular connection from future corrosion will wonder why they are getting continued callbacks from the same address.

U S West purchased gel-filled jacks from Suttle Apparatus, a division of CSI Communications Systems Inc. (Hector, Minn). The Corro-Shield jack contains an anti-corrosive, memory-retaining gel called GelGuard, which is manufactured by Raychem (Menlo Park, Calif.). As the modular plug is inserted into the jack, the gel deforms and then reforms around the plug to seal. When the plug is removed, the gel actually peels off the plug and snaps into its original shape. The gel stays in the jack, not on the plug.

Although Suttle has performed rigorous accelerated lab tests on the Corro-Shield gel-filled jack, little did the company know that Grand Forks would be the field test to beat all field tests. No lab testing could have predicted the 100% performance rate they discovered after the Grand Forks floodwaters receded.


Suttle Apparatus

Closeup of a gel-filled jack. Notice the gel completely fills the plug cavity to seal the gold-to-gold connection.

Roger Amundson, marketing manager for Suttle Apparatus, says, "Obviously, the Grand Forks flood was a worst-case scenario. The river water was filled with corrosive contaminants, and our gel-filled jacks stood the test and kept them out—even after 15 days under water. These were conditions we could never have duplicated in our laboratory."

Initial estimates show that hundreds of homes and businesses were equipped with the gel-filled jacks. The river had run through them, and when it left, they still delivered crisp, clean dial tone. ■

Rick Muscoplat is a freelance telecommunications writer based in Minnesota.

TAKE A LOAD OFF

Switch Analog Pairs to Digital
and Back...
With a Twist of the Wrist

Introducing a time and labor saving new way to unload analog pairs for use as DSL, T1 or ISDN lines... the Coil® SLCCase™ switchable load coil case (patent pending). Simply open the access door and switch panels allows you to instantly switch coils in or out of any circuit...without opening the case or touching a wire!

Installing a SLCCase reduces engineering and construction costs, service activation leadtimes, multiple dispatching and labor group conflicts.

You'll unload line conditioning problems and switch to savings. Contact your local Coil representative or call us at **847-806-6300**, today!

ci Coil

Charles Industries, Ltd.
Charles Center, 5600 Apollo Drive
Rolling Meadows, Illinois 60008
Telephone: (847) 806-6300 Fax: (847) 806-6231
E-mail: mktserv@chasind.com
Web: http://www.chasind.com

Circle 120

Coil and SLCCase are trademarks of Charles Industries, Ltd.

OUTSIDE PLANT

SASSAN BABAIE

RAM-ing through xDSL deployment

Architecture incorporating remote access muxes can give carriers plug-and-play capability.

INTEGRATION OF ASSYMETRICAL DIGITAL SUBSCRIBER LOOP (ADSL) TECHNOLOGY INTO DIGITAL LOOP CARRIER (DLC) REMOTE TERMINALS IS A CRITICAL SUCCESS FACTOR FOR MASS MARKET, WIDE-AREA ADSL DEPLOYMENT. DLC SYSTEMS HAVE BEEN DEPLOYED BY MOST LOCAL EXCHANGE CARRIERS (LECS) IN THE UNITED STATES DURING THE PAST 15 YEARS TO PROVISION POTS FOR NEW RESIDENTIAL NEIGHBORHOODS AND BUSINESS PARKS. A DLC SYSTEM MULTIPLEXES A CERTAIN NUMBER OF POTS, INTEGRATED SERVICES DIGITAL NETWORK (ISDN), AND PRIVATE/LEASED LINES OR OTHER NARROWBAND SERVICES ONTO EITHER HIGH-SPEED COPPER (T1 OR HDSL) OR FIBER (ASYNCHRONOUS OR SYNCHRONOUS OPTICAL NETWORK) FACILITIES FOR TRANSPORT FROM THE DLC TO THE CENTRAL OFFICE (CO).

Until the late 1980s, DLCs were fed predominantly by repeatered T1 facilities. Since then, fiber optic facilities have become the preferred method of feeding DLC RTs. Many LECs have been deploying DLCs in their outside plant networks based on prescribed rules; as a result, DLC penetration is now nearing 50 million lines, accounting for nearly 30% of the total installed base of telephone lines in the U.S. DLC penetration continues to grow rapidly as LECs use fiber-fed DLCs to reinforce existing outside plant facilities and serve new communities.

ADSL is generally considered to be a home-run application—that is, a service extending from a CO to the customer premises. To provide ADSL, the CO is equipped with a digital subscriber line access multiplexer (DSLAM) that directly feeds the customer's copper pair from the CO to the customer's premises (see Figure 1). However, if the customer's copper pair is derived from a DLC remote terminal, the ADSL termination point would have to reside at the RT.

A system that terminates ADSL lines in a remote site is called a *remote access multiplexer* or remote DSLAM (see Figure 2a and 2b, page 50). A remote access multiplexer generally multiplexes fewer ADSL lines (less than 100) than a remote DSLAM, which muxes several hundred lines. Given that RT sites are generally outdoor cabinets which serve 500 to 1,000 lines, a remote access multiplexer is considered sufficient for most typical take-rate scenarios.

Remote access muxes are simpler in functionality compared to remote DSLAMs and are generally subtended from CO based DSLAMs. Other issues of concern include:

- Whether the RT is fed by copper or fiber;
- Whether the installed system has sufficient space for a remote access multiplexer to be installed;
- Whether right-of-way is available and economic enough to justify a RAM or remote DSLAM in its own cabinet; and
- The potential take rate, which will make one solution more preferable than the other.

GETTING PAST THE LINGO

DLCs have been a mainstay of LEC service provisioning rules for the past 20 years. U.S. demographics are such that DLCs fit nicely into the nation's growth patterns; as the population migrated to suburban areas, LECs were faced with either following existing planning rules or coming up with new ones.

Older planning rules generally meant that customers had to be located within reach of the CO, whereby each loop would have a maximum loop resistance of 1,300 ohms and loading coils would be placed on twisted pair that extended beyond18 kilofeet to 24 kft., if necessary. These rules are commonly known as the Resistance Design rules.

In 1983, the Modified Resistance Design rules were introduced. These modified rules extended the maximum loop resistance to 1,500 ohms for loops between 18 kft. and 24 kft. and required the use of H88 loading coils for loops that extended beyond 18 kft. However, these rules meant that LECs had to deploy COs whenever a new subscriber pocket—such as a new subdivision, shopping mall or business park—was built.

An alternative mechanism was proposed based on carrier serving area (CSA) rules whereby maximum loop distance would be limited to 12 kft. when using 22 or 24 American wire gauge (AWG), or 9 kft. when using 26 AWG with no loading coils placed in the loop. Bridged taps, which essentially are unterminated extensions, were limited to 2,500 ft. with no bridged tap to exceed 2,000 ft.

CSA rules brought about mass deployment of DLCs. Most LECs began planning for growth based on CSA criteria, strategically placing DLCs in subscriber pockets that would ensure compliance with CSA rules and allow for reasonable growth. Initial deployments of DLCs were based on two basic assumptions:

- It was less expensive to deploy DLCs than remote switches; and
- It was less expensive to deploy lower density copper cable and multiplex many customers over a digital facility rather than deploy high-density copper cables. (Hence, the term "pair gain" was coined to reflect the concept of 12:1 savings in copper loops as a result of multiplexing subscribers over T1 back to the CO from a DLC.)

> **Putting a DSLAM in a CO or every remote DLC site is possible, but hardly seems viable, given the number of sites.**

These assumptions led to mass deployment of DLCs over T1 repeatered copper feeder facilities from the late 1970s to the mid-'80s. At that time, many LECs began to consider the use of fiber optic facilities in the local loop to reinforce feeder plants and add capacity to their outside plant networks. By the early 1990s, many DLC systems were using fiber optic transport as their primary feeder facility.

DLC proliferation has resulted in a number of fundamental changes in LEC outside plant network architecture, such as the following:

- As much as 30% of all loops in the U.S. are now derived from DLCs. DLC deployment varies in each region of the country and tends to depend highly on the internal planning rules of each LEC.
- There is strong likelihood that newer subdivisions, business parks, malls and other centers will be served by DLCs.

Because LEC suburban customers also tend to be the target users of xDSL, and because they more than likely will be served by a DLC, xDSL solutions for these customers are essential. Solutions that only allow carriers to deliver the service to customers on home-run copper will keep LECs from reaching their most lucrative and immediate potential customer base.

Glossary of terms

ADSL	asymmetrical digital subscriber line
AWG	American wire gauge
CEV	controlled environment vault
CO	central office
CSA	carrier serving area
DLC	digital loop carrier
DSLAM	digital subscriber line access multiplexer
HDSL	high-speed digital subscriber line
ISDN	integrated services digital network
POTS	plain old telephone service
RT	remote terminal
SOHO	small office/small home
Sonet	Synchronous Optical Network

BRINGING xDSL TO THE DLC

Some believe that the best way to reach all customers is to put a DSLAM in a CO or every remote DLC site. Although it's possible, it hardly seems viable, given the number of COs in the U.S. (estimated at about 20,000) or remote DLC sites (estimated at roughly 100,000). To deploy xDSL service regionwide, a LEC would have to make a massive investment in networking equipment. Some LECs may choose the longer term solution of deploying fiber deeper into the network, which further pushes out deployment of xDSL. Other options may

Figure 1: Home-run ADSL

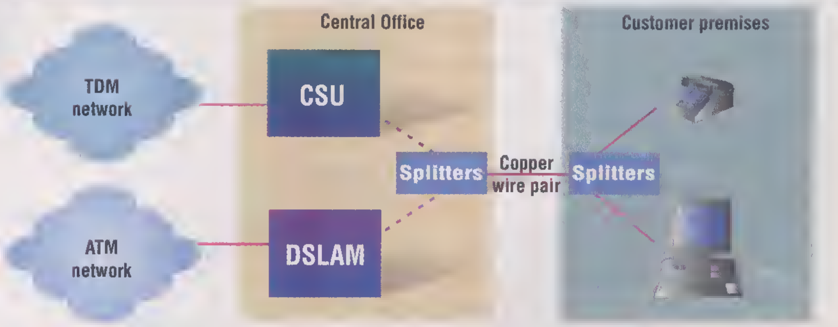


Figure 2a: Remote access multiplexer in DLC remote sites

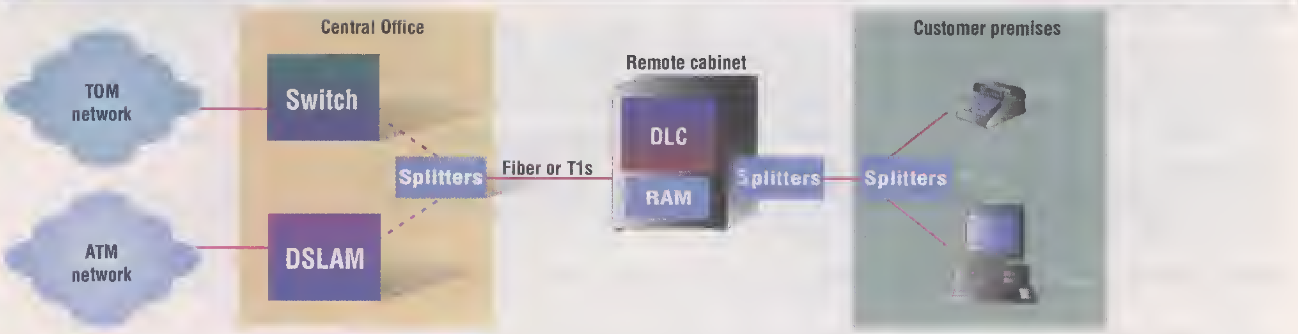
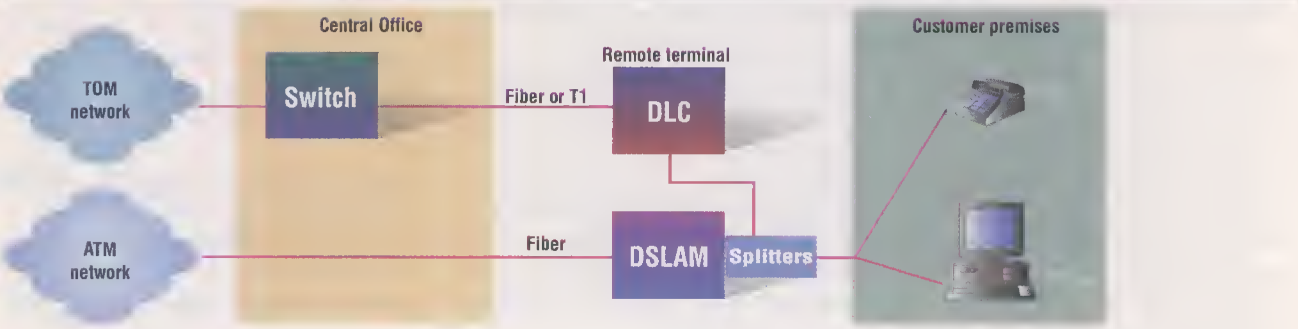


Figure 2b: DSLAM in DLC remote sites



include xDSL cards for the DLC, but they tend to rely on empty slots which are slated for POTS.

The most prudent approach to xDSL deployment may be to deploy DSLAMs in certain COs and extend bandwidth to remote COs and DLC sites using subtended remote access multiplexers (see Figure 3). These devices would scale from a small number of lines (eight, for example) and would scale in a modular fashion to add capacity as needed. These remote access multiplexers can be placed in existing remote DLC sites, regardless of whether the site is an outside plant cabinet, a hut, a controlled environment vault (CEV) or on the customer's premises. Because remote access multiplexers are subtended from a DSLAM, their functionality can be limited to xDSL line termination, concentration and multiplexing into packet/cell streams, and termination of network interfaces.

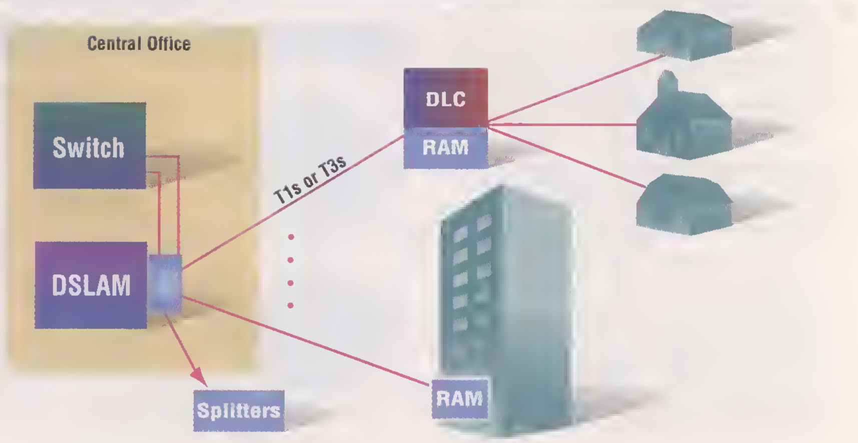
Two scenarios exist for remote access multiplexer deployment.

- In applications where the current feeder infrastructure serving the DLC remotes is repeatered T1s, the remote access mux's feeder interface will be one or more T1 facilities as well. In this case, with four provisioned T1s, assuming an eight-line remote access mux, each customer would have a peak rate of 6 Mbps and a guaranteed minimum rate of 800 kbps. Of course, speeds and feeds can scale to suit service tariffs on a case-by-case basis. An example would be a single T1 feeder for a remote access multiplexer that can scale from one to eight subscribers, each with a peak rate of 1.5 Mbps and guaranteed minimum of 192 kbps.

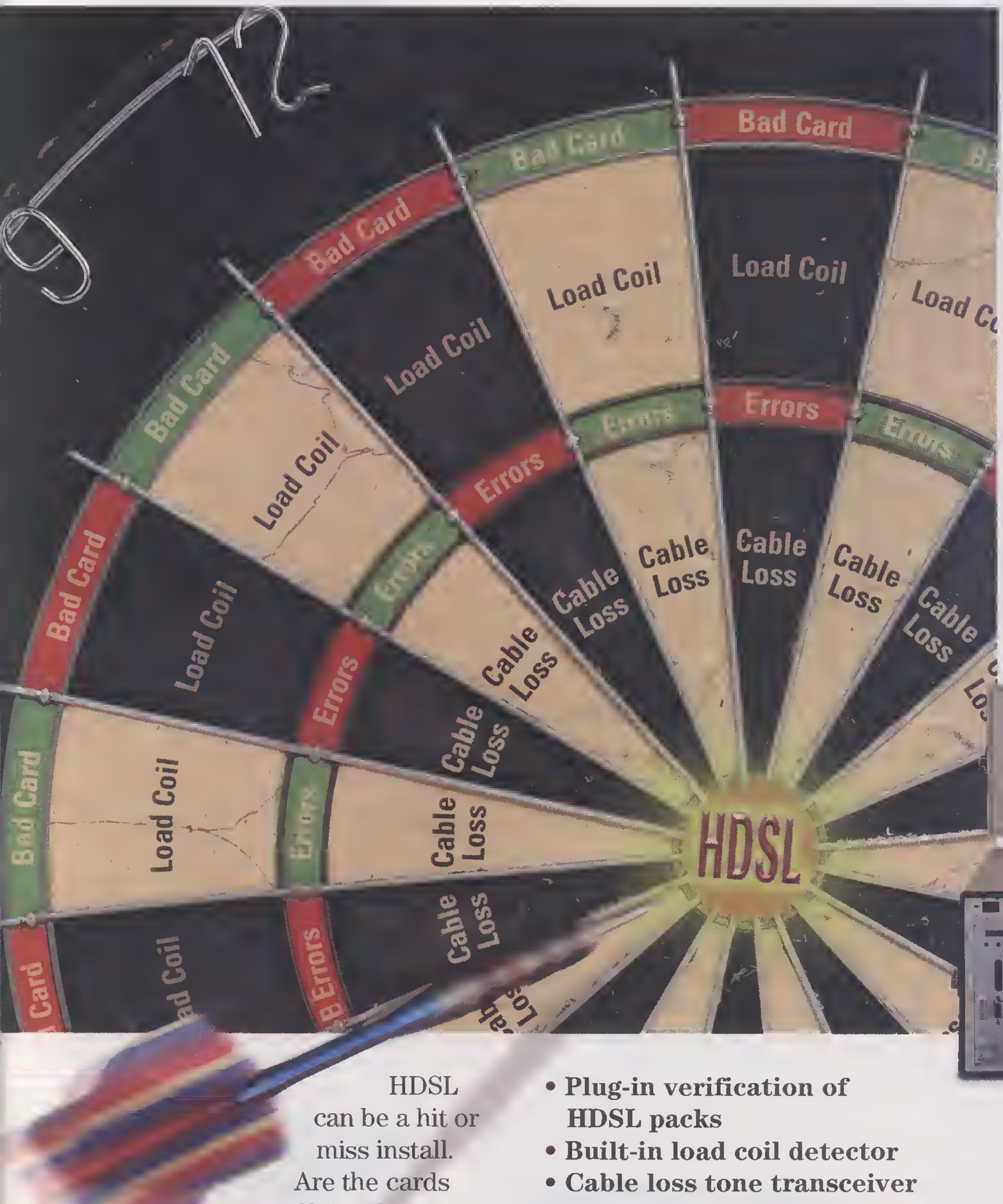
Where repeatered T1s serve DLC remotes, the remote access mux's feeder interface will be in one or more T1 facilities as well.

- Fiber-fed remote DLCs would have sufficient capacity to enable a DS-3 to be the network interface of choice for the remote access multiplexer. Most

Figure 3: Distributed architecture based on remote access multiplexers



This is the game.



This is how you play it.

HDSL can be a hit or miss install. Are the cards good? Any load coils? Spans OK? Some cable loss? Or Bit errors? Finding any combination of problems isn't easy. It's time consuming.

Perhaps you could use an assistant. The HP CERJAC HDSL Installer's Assistant. The complete HDSL turn-up test set with everything you need to qualify HDSL lines.

- **Plug-in verification of HDSL packs**
- **Built-in load coil detector**
- **Cable loss tone transceiver**
- **Turn-up T1 BERT tester**
- **Doubler and remote unit slot**

The HP CERJAC HDSL Installer's Assistant gives you access anywhere in the circuit, and a better understanding of card and line conditions.

To hit your HDSL targets every time, call 1-800-9CERJAC, contact your local HP representative or visit our web site at www.hp.com/go/hdslassistant.

Circle 121

CERJAC
TELECOM TESTERS

The HP CERJAC HDSL Installer's Assistant®

© Hewlett-Packard Company ADCMDHDSL97

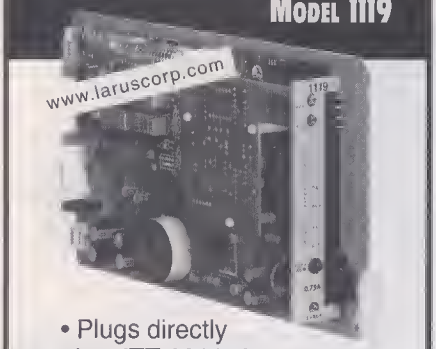
HEWLETT® PACKARD

T1 REPEATER

SPAN CURRENT POWERING
AUTOMATIC REGULATING

MODEL 1119

www.laruscorp.com



- Plugs directly into ITT 621170 shelves
- -48 V power
- Drives 0 to 655 Ft to DSX
- True BPV Detector for B8ZS

ISO 9002 QUALITY ASSURED LARUS

Call Larus
800/999-9946
Larus Corporation
1560 Berger Dr. • San Jose, CA 95112

Circle # 122

INFORM ◆ INTRODUCE ◆ INFLUENCE ◆ INSTRUCT

CUSTOM REPRINTS

Reprints are highly effective when you use them to:
- Develop direct-mail campaigns
- Provide product/service literature
- Create trade show distribution materials
- Present information at conferences and seminars
- Train and educate key personnel, new hires
- Enhance press kits
- Compile reference materials
- Track trends and emerging technologies

America's Network

BRIAN KANABA
ADVANSTAR MARKETING SERVICES
1-800-225-4569 ext. 155
216-891-3155
Fax: 216-826-2865

fiber-fed remote DLC sites do not fully use the bandwidth of the fiber terminal, and have excess DS-1 and DS-3 capacity that can be provisioned for xDSL. In this case, the DS-3 network interface will allow either a single eight-line remote access mux to enable close to 6 Mbps as a guaranteed rate to all customers, or cascade multiple remote access muxes for sharing the same DS-3 facility, which then reduces the guaranteed rate according to the number of subscribers contending for the DS-3 feeder. For example, two cascaded remote access multiplexers sharing the same DS-3 feeder would enable a guaranteed rate approaching 3 Mbps per customer.

In either case, the LECo can offer region-wide service, accept service orders, deploy remote access multiplexers where required, and backhaul traffic to DSLAMs located in strategic COs. As DSLAM capacity to subtended remote access muxes is exhausted, additional DSLAMs can be added to broaden CO coverage.

PLANNING RULES AND DEPLOYMENT

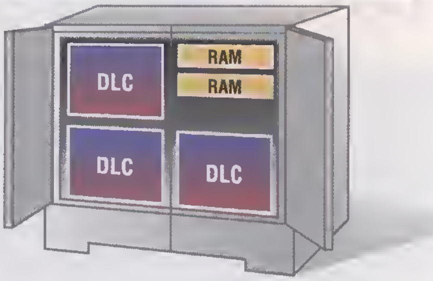
Most remote sites have space, power, cabling and heat dissipation constraints; these issues must be considered when remote access multiplexers are deployed.

Space, power, cabling and heat dissipation must be considered when deploying remote access multiplexers.

AC power and a battery backup system is generally available in remote sites. An LEC may choose to power from either source, depending on the grade of service desired and acceptable impact on existing backup times in case of an AC outage. To preserve battery backup time for POTS and other services, an alternative power-down mode can be used in the remote access mux to disconnect it from the battery backup system upon AC failure.

Physical space is generally a premium in remote sites; thus, packaging is of paramount importance. Rack-mountable options for remote access muxes are most desirable for existing DLC cabinets, CEVs, huts and customer sites.

Figure 4: Typical remote terminal cabinet



Remote DLC cabinets are usually the most challenging areas, but usually have unused rack space of about 4 to 6 inches, if not more; this is enough space to mount at least one, if not more, remote access multiplexers (see Figure 4). In some cabinets, vertically mounting the units in unused spaces may be the only viable alternative.

Cabling is one of the most important issues, as it offers quick connect and disconnect options for power and network interfaces to enable rapid installation and maintenance. Quick connect and disconnect options for subscriber terminations let LECs provide speedy service turnup and easy churn management.

Last, but not least, is the issue of heat dissipation. Analysis of installed cabinet configurations indicate that most existing remote cabinets reach a thermal limit when the number of xDSL lines exceeds 36. As xDSL chip sets are integrated further, it's likely we will see the thermal imposed limitation increase to 72 lines or more within the next few years. Because the average density of remote DLC sites is from 300 lines to 500 lines, it's anticipated that the remote access multiplexer solution will enable xDSL penetration of 10% in the first two years of deployment and as much as 20% to 30% in subsequent years. Given the anticipated pace and scale of service rollouts, these penetration rates should meet deployment plans of most LECs. Furthermore, as subscriber penetration increases, remote access mux deployments in adjunct cabinets still can be the lower cost alternative to remote DSLAMs.

THE ADVANTAGES

Because most service providers' networks are laden with DLCs, a solution that lets DLC-derived customers subscribe to xDSL must be part of every LEC's deployment strategy. Given the choices of embedded xDSL cards for DLCs or standalone, remote DSLAMs, the remote access multiplexer architecture offers a number of advantages.

- Subtended remote access muxes may be the least complex and, therefore, the lowest cost option, because they rely on the management resources of the DSLAM from which they are subtended.
- Remote access multiplexers are easy to provision and maintain, because they are transparent to the legacy network, feeder facility and installed equipment. Furthermore, these systems do not take up the space required for other services, such as POTS.
- Investment is incremental.
- It's is a universal solution that can plug-and-play in any environment, including a remote DLC site, CEV, hut or even a basement of a multitenant building.

Remote access multiplexers should be considered as more than a "box" for quick deployment or a stop-gap measure. These units offer an alternative, distributed architecture that enables rapid deployment of xDSL services to all customers, including those served by DLCs, without the burden of massive infrastructure investment. The availability of remote access muxes can enable rapid deployment of high-speed Internet and remote LAN access to DLC-served users.

Remote access multiplexers should be considered as more than a 'box' for quick deployment or a stop-gap measure.

Considering that most small office/home office (SOHO) users and telecommuters are suburbanites served by DLCs, a universal remote access mux solution would provide the plug-and-play capability resulting in a cost-effective and expeditious market launch. ■

Sassan Babaie is vice president of marketing at Pulsecom Inc. (Herndon, Va.)

Growing **Corning**

Established in 1851, Corning Incorporated creates leading-edge technologies for the fastest-growing segments of the world's economy. We manufacture optical fiber, optic cable, photonic components and high-performance glass and electronic components for communications-related industries. In recognition of our innovative spirit, the President of the United States awarded us the National Medal of Technology.

In short, we're a company known for pushing the traditional boundaries of research and technology. And to push them even further, we're doubling the size of our North American Research & Development and Manufacturing facilities and expanding existing labs in Russia, France, and Japan.

To keep pace with this expansion, we're seeking experienced manufacturing and research/development professionals to join our team in the areas of technical glass, ceramics, polymers and related materials.

CORNING

Visit Our Hospitality Suite During National Fiber Optics Engineering Conference.

For Suite Information or to Arrange a Private Interview call

1-888-324-1225

Through, Wednesday, Sept. 24th or Fax: 607-974-2311 or e-mail: r&drecruit@corning.com

Corning is an equal opportunity employer M/F/D/V.

Circle # 123

OUTSIDE PLANT Notebook

ANNIE LINDSTROM

TOOL EASES xDSL INSTALLATION

Fluke Corp. (Everett, Wash.) has unveiled the xDSL OneTouch Installation Assistant and verification tool (see photo). Service providers can use it to deploy digital subscriber line services to show customers the type of performance the line is supplying.

OneTouch features an icon-based interface and a touch-sensitive screen. It connects directly to the Ethernet interface of any xDSL modem. After establishing a connection with a OneTouch unit located at the DSL access modem, the unit measures upstream and downstream transmission rates simultaneously, as well as collision and usage rates, and errors; automatically discovers transmission rates for rate adaptive DSL (RADSL); and broadcasts and determines network connectivity for 10 Mbps and 100 Mbps Ethernet networks.

Speedometer gauges appear on the unit and display the downstream speed as the test progresses. When the test is complete, the instrument at the central office sends its measurements to the unit at the subscriber end, which then displays measured speeds, test duration time and frames transmitted.

The OneTouch is available in a 10 Mbps Ethernet configuration for a list price of $4,195. It is available in a combination 10Mbps/100 Mbps Ethernet configuration for a list price of $5,495.

FLUORIDE AMPLIFIER ON THE MARKET

Galileo Corp. (Sturbridge, Mass.) introduces its first fluoride-based optical amplifier module (see photo). The FluoroAmp is designed for use in wavelength division multiplexed and dense wavelength division multiplexed (WDM) networks.

Based on Galileo's proprietary fluoride fiber, the unit exhibits uniform gain in excess of 30 dB from 1534 nm to 1562 nm; saturated output power in excess of 13 dBm, and a noise figure of less than 4.5 dB. It incorporates components such as WDM couplers, optics, a pump laser and monitoring photodiodes in a compact module that interfaces electronically via a SCSI-2 connector and silica SMF-28 fiber pigtails with the option of any standard fiber connector.

TTC FORMS TESTING SUPPORT GROUP

TTC, a Dynatech company (Germantown, Md.), has created the Advanced Applications Engineering (AAE) group, providing network test and measurement technical consulting and support. The group's offerings include software customization, network integration assistance, field applications assistance, test procedure development and network consulting.

Service provider and end user organizations are encouraged by TTC to use the group as a resource to help resolve test and measurement issues such as the integration of test devices and the selection of appropriate test methodologies and processes. AAE aims to help customers develop and refine test procedures and strategies, create customized applications for specific testing needs, and address basic network design strategies for maximizing testing effectiveness.

TIA PUBLISHES FIBER STANDARD

The Telecommunications Industry Association's FO-2.5 subcommittee for Outside Fiber Optic Plant Installation has published a national standard defining the location of an installed outside fiber optic plant relative to its physical environment.

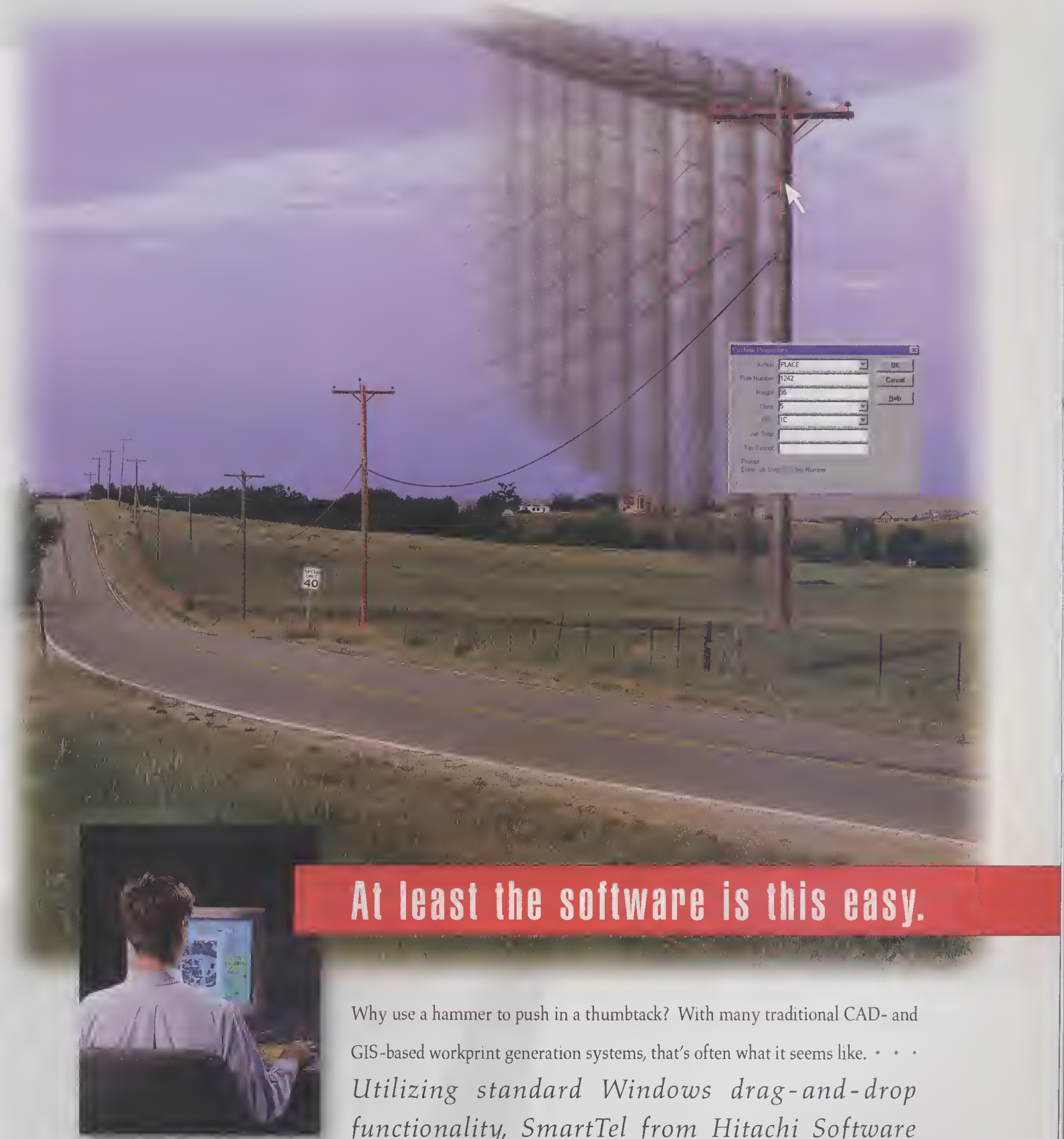
The standard, TIA/EIA-5890-A, includes related protective measures necessary to reduce the probability of cable damage. It addresses fiber optic cables directly buried, placed in duct, in non-navigable waterways, or in transition from underground to aerial structures. It further specifies the location-marking and physical operations protection of such cables. To obtain copies of the standard, contact Global Engineering Documents at 800/854-7179 or visit http://global.ihs.com.

AMP LAUNCHES NEW FIBER OPTIC STRATEGY

AMP Inc. (Harrisburg, Pa.) is consolidating six of its optical fiber divisions into two highly focused groups. The move is part of a corporate reorganization announced earlier this year, when AMP formed the Global Communications Business (GCB) unit, and named Jay Hassan corporate vice president and president of the new unit. One of the new groups, Global Opto-Electronics, combines the manufacturing and marketing of active and passive components to bring advanced technology to market faster. Terence Unter, former chairman and CEO of Alacatel Optronics, has been named vice president and general manager of the group.

The second new unit, Global and Optical Cable and Accessories, will address the manufacturing, marketing and distribution of optical fiber cable, connectors, cable assemblies and adapters, tooling and cable management solutions aimed primarily at the datacom market.

In addition, AMP has named Narinder Kapany, former director of global optoelectronics advanced technology/product programs at AMP, as chief technologist for the Global Communications Business. He reports to Hassan.



Custom Properties

Action: PLACE

Pole Number: 1242

Height: 35

Class: 5

[illegible]: 1C

Job Step:

Tax District:

Prompt

Enter ob Step [illegible] tep Number

Why use a hammer to push in a thumbtack? With many traditional CAD- and GIS-based workprint generation systems, that's often what it seems like. • • •

Utilizing standard Windows drag-and-drop functionality, SmartTel from Hitachi Software allows users to plan, design, and manage changes to outside telecommunications networks easily and efficiently. • • • • • • • • • •

SmartTel combines a comprehensive library of over 230 industry-standard telecommunication symbols with Hitachi's industry-leading raster imaging technology. The result is a simple yet complete solution for creating workprints, planning maps, and right-of-way drawings, without the training costs, and at a price that fits almost anyone's budget.

For a free demonstration of SmartTel, or to register for our Corporate Evaluation Program, contact our Customer Support staff directly at 1-800-447-2579. http://www.hitachisoft-co.com

Hitachi Software
Quality Solutions Worldwide

Circle 124

GRANDMA'S CALL TO ACTION

RECALL
FROM THE AMERICA'S NETWORK ARCHIVES

Thanks to women like Myrtle Gilpen, a 1918 telephone cord repairer, the gender has definitely come "a long way, baby."

In the early 20th Century, women like Gilpen were hired by phone companies such as Southern Bell Systems as replacements for the male workers who became otherwise engaged—in military service during World War I.

These women, known as "telephone men," according to an article in the February 1918 issue of *Telephone Engineer*, were not only quick studies, but performed their jobs well beyond already high expectations.

"Man's work is easy," sniffed Gilpen, when asked about her role as a cord repairer. "At first it took me a long time to repair a cord; now I can repair one every five or six minutes. I take my little machine and go up and down the board. Everybody looks at me, but I feel that my work is just as important as that of the operators."

Another "telephone man," known as Miss Mason, added that while she was not allowed to wear a uniform and shoulder a gun, she could at least take the place of a man who was long gone to war.

Each woman desired to do her "bit" and each felt that, in filling the place of a soldier in such an essential industry as the telephone business, she would be truly serving her country.

(According to the Women's Bureau of the Labor Department, roughly 28,000 women are working in the U.S. telecommunications industry today.)

The lenders like us, they really like us

Media/telecom bank Daniels & Associates reports that it reportedly broke its all-time record bank by completing 53 transactions (worth $3.8 billion) during the first six months of 1997. Bank officials attribute the activity to the pace of mergers and acquisitions within the telecom sectors, as major companies beef up and execute clustering strategies. "The game is still geographic concentration," according to Brian Deevy, Daniels' president and CEO. "Thankfully, lenders have been more understanding of the growth prospects of media and telecommunications companies based upon their analysis of various new services that are now beginning to be introduced." Notable deals include:

- The Tele-Communications Inc. (TCI) and Cox Communications Inc. trade of 20 CATV systems serving roughly 600,000 subscribers in 12 states;
- The CableOne Inc. and TCI American Cable Holding II L.P. trade of 16 CATV systems, serving 103,000 subscribers in five states;
- CommNet Cellular's acquisition of certain partnership interests in Iowa RSA 13 from 360 Communications Co.; and
- The market expansion of Internet service provider Verio Inc. into Michigan.

Industry Sector	No. Transactions	Aggregate Value ($)
CATV	30	2,434,801,000
Telecommunications	12	231,651,000
Other sectors (broadcast, wireless cable, Internet)	11	1,182,426,000
Type of transaction	**No. Transactions**	**Aggregate Value ($)**
Mergers & acquisitions	37	3,683,999,000
Corporate finance	5	59,474,000
Financial advisory	11	105,405,000

Source: Daniels & Associates

COULD 'CABLEGATE' BE FAR BEHIND?

Move over, Bill and Hillary—a structured cabling manufacturer has just moved into 1600 Pennsylvania Ave.

IdentiComm Inc., makers of EZspeed structured cabling, reports that it has relocated its corporate offices to the famous address—with a caveat: it's in York, Pa.'s CyberCenter, not the hub of D.C. No reports at this time whether a jogging trail has been constructed for the firm's CEO.

GENTLEMEN, PLEASE REMOVE YOUR HATS (AND PASS THE SUNBLOCK)

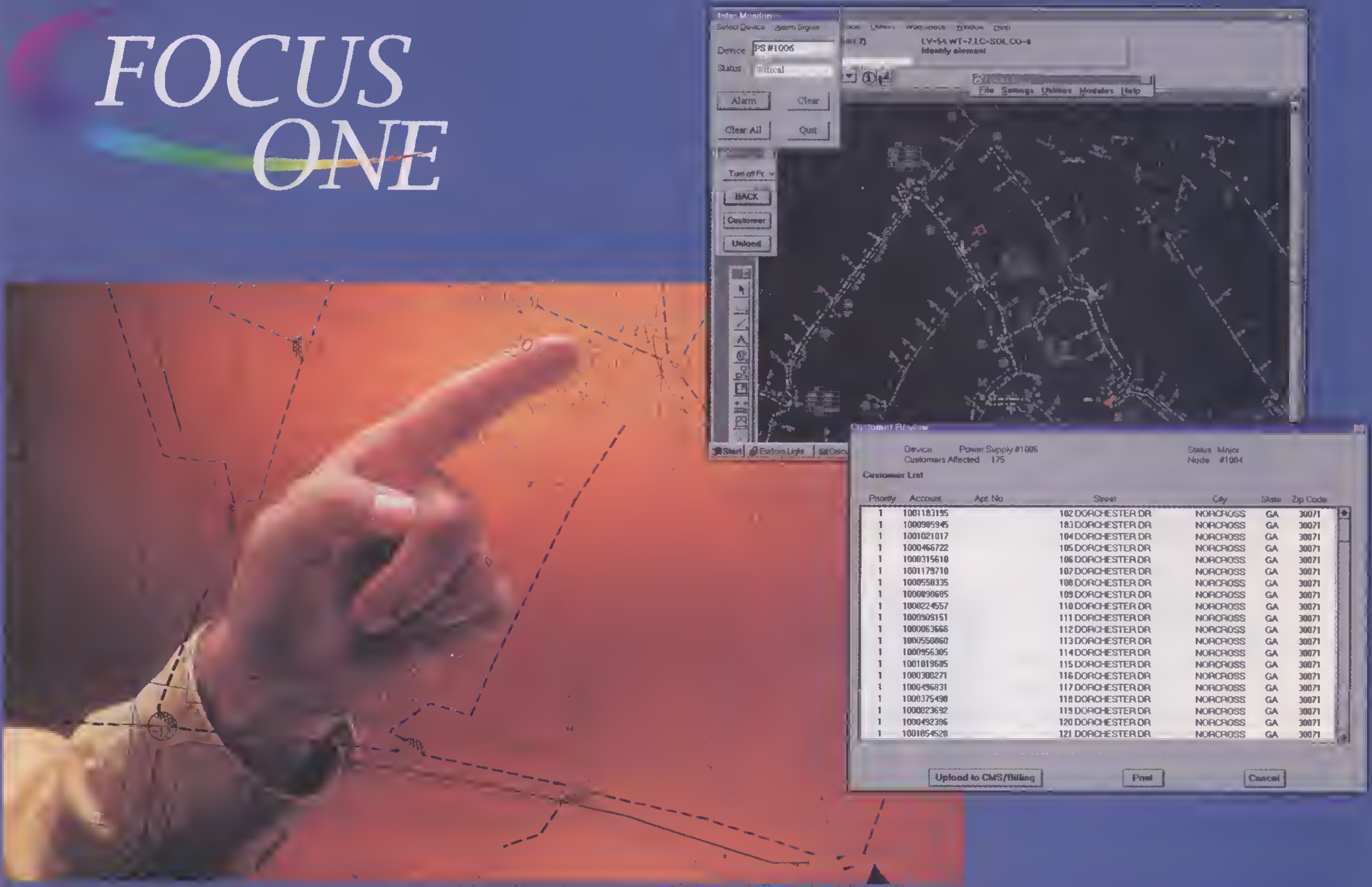
Thank you to Channel Commercial, makers of network enclosures and pedestals, for recently giving us a tour of its manufacturing plant in the California desert town of Temecula, which culminated in a most solemn visit to the company's PED cemetery—all puns intended.

Channel's Jim Parchment created the working memorial eight years ago as a way to test the structural viability of its OSP pedestals and enclosures in the real world. The above- and below-ground units (from Channel as well as its major competitors) are installed in California desert sand in an area where the sun always shines and temperatures regularly exceed 100°F during the summer months (*believe us—we were there*). The tortured units are then tested for durability. Some make it, some don't. (We didn't—and soon beat a hasty retreat to the local lunch hangout for mass quantities of iced beverages.)

Unlike this one, no bodies are buried at the PED cemetery.

Network Mapping to Network Management

FOCUS ONE



Device PS #1006

Status Critical

Device Power Supply #1006

Customers Affected 175

Status Major

Node #1004

Customer List

Priority	Account	Apt No	Street	City	State	Zip Code
1	1001183195		102 DORCHESTER DR	NORCROSS	GA	30071
1	1000905945		183 DORCHESTER DR	NORCROSS	GA	30071
1	1001021017		104 DORCHESTER DR	NORCROSS	GA	30071
1	1000466722		105 DORCHESTER DR	NORCROSS	GA	30071
1	1000315610		106 DORCHESTER DR	NORCROSS	GA	30071
1	1001179710		107 DORCHESTER DR	NORCROSS	GA	30071
1	1000550335		108 DORCHESTER DR	NORCROSS	GA	30071
1	1000090685		109 DORCHESTER DR	NORCROSS	GA	30071
1	1000224557		110 DORCHESTER DR	NORCROSS	GA	30071
1	1000909151		111 DORCHESTER DR	NORCROSS	GA	30071
1	1000063666		112 DORCHESTER DR	NORCROSS	GA	30071
1	1000550060		113 DORCHESTER DR	NORCROSS	GA	30071
1	1000956305		114 DORCHESTER DR	NORCROSS	GA	30071
1	1001019605		115 DORCHESTER DR	NORCROSS	GA	30071
1	1000300271		116 DORCHESTER DR	NORCROSS	GA	30071
1	1000496831		117 DORCHESTER DR	NORCROSS	GA	30071
1	1000375490		118 DORCHESTER DR	NORCROSS	GA	30071
1	1000023692		119 DORCHESTER DR	NORCROSS	GA	30071
1	1000492386		120 DORCHESTER DR	NORCROSS	GA	30071
1	1001054520		121 DORCHESTER DR	NORCROSS	GA	30071

FocusOne Software is the Complete Solution

- One system for field data collection, network mapping, planning, design
- Complete RF/fiber design and documentation
- Enterprise-wide access
- Interfaces to operational support systems for rapid troubleshooting

All the Tools You Need!

FocusOne is a complete, open-architecture solution to all of your mapping, design and fiber network information management needs. To find out more call 770-448-0977 or visit our web site at **http://www.cisfocus.com**.

FOCUS ONE

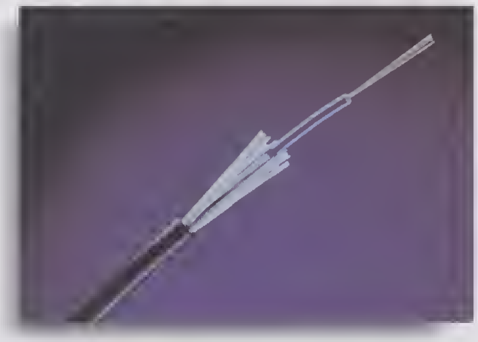
Communications Information Software, Inc.
6855 Jimmy Carter Boulevard, Suite 2200
Norcross, GA 30071
Tel: 770 448-0977
Fax: 770 242-8583
E-mail: sales@cisfocus.com
Web Site: http://www.cisfocus.com

Circle 125

Indoor/outdoor cable

The Freedm/LST (LANscape single tube) cable is flame-retardant, UV-stabilized and fully waterblocked. Freedm/LST cables are designed for indoor/outdoor applications and are suitable for installation in riser, duct and aerial environments. The compact, all-dielectric cable uses loose-tube design for up to 12 fibers, and is available in multimode and hybrid versions. Additionally, dielectric strength elements around the core eliminate preferential bending. The cables are compatible with the company's Buffer Table Fan-Out Kit for rapid, simple termination. *Siecor Corp. (Hickory, N.C.)*

www.siecor.com or circle 250



Access Bank

Fast deployment of D4 compatible channel cards in TR-008 Integrated Digital Loop Carrier (IDLC) systems — including ISDN, Dataport, voice and Tollgrade MCU DC alarm and DC bypass — is easier with the Slash-2400 Time Slot Access Bank.

The Slash-2400 operates as an add/drop channel bank, converting virtually any IDLC system into Universal DLC — one shelf at time. When installed in a CO, conversion is accomplished without additional equipment at the DLC remote terminal.

The SLASH-2400 bank accesses up to 24 unused time slots, enabling carriers to deploy special services. economically. Services may be added without the need for digital cross-connect systems and hairpinning arrangements in the CO. Any DOS time slots on the intercepted DSI facility that are unused by the Slash-2400 bank remain available for use as integrated facilities.

The package consists of a channel bank with connections for T1, office clock, office battery, tip and ring access, and three common cards: a System Timing and Control Unit (STC), a Time Slot Access Unit (TSA) and an Alarm card. *Tollgrade Communications Inc. (Cheswick, Pa.)*

Call 216/655-9690 or circle 254

Receivers

Models 86B and 86BH tracking beacons are designed for super reliability performance. Both models can be used with the Subsite brand walkover tracking receivers. Features include improved shock/vibration protection; a low pressure operating environment; reliable solid state electronic sensors, including a pitch sensor for stable readings; enhanced temperature-sensing response; and a deeper operating range. *Subsite Electronics (Perry, Okla.)*

Call 405/336-5546 or circle 264

Bridging office amplifier

The Broadband Bridging Office Amplifier (BOA) is a cost-effective, convenient solution for patching and rolling within a broadband environment. The Hitless Patching Module is a more versatile unit that incorporates a BOA within the DSX module. Both products preserve critical data while supplying the patching function.

The BO Amplifier is a dual-direction module that amplifies monitor signals at the DSX to allow patching without service interruption. With a maximum output range of 50 ft., it is suitable for rolling or patching broadband circuits with a single lineup. It needs no additional wiring or separate equipment to house the unit.

The Hitless Patching Module incorporates an extra jack to provide a duplicate OUT circuit for rearranging the network which the integrated amplifier eliminates the risk of network outages or loss of critical data during the patching process.

DSX-3 Broadband Connectivity System houses 24 terminations in 4 inches of vertical rack space-using traditional WECO jacks and BNC connector technology. A pre-wireable backplane makes installation easy. A full array of multiple plug-in cards, including new attaching modules, allows users to customize systems.
Telect (Liberty Lake, Wash.)

www.telect.com or circle 257

Transmitter

The Sparrow transmitter generates a clean CW output signal up to 1 watt and is programmable over the PCS or PCN frequency spectrum. Small and lightweight, the portable Sparrow transmitter is inconspicuously deployed. Its rugged structure allows it to withstand rough handling. Sparrow is programmed using a detachable handheld terminal which plugs into the RF module. It also includes an AC adapter and can operate using rechargeable batteries that provide 7 to 9 hours of RF output at full power.
MLJ (Arlington, Va.)

Call 703/741-3500 or circle 265

Cable fasteners

Caddy Fasteners have new stabilizer wings on the MAC2 support clips for wobble-free support of single or multiple runs of MC/AC cable. The break-apart design of the MAC2 snaps in half, making two fasteners for single cable runs. Pre-riveted factory assemblies support MC/AC cable to metal studs, wood studs, T-Grid, beams, purlins, concrete and drop wire/rod. All MAC2 Series support clips and assemblies install in seconds without tools for most applications.

Erico Inc. (Solon, Ohio)

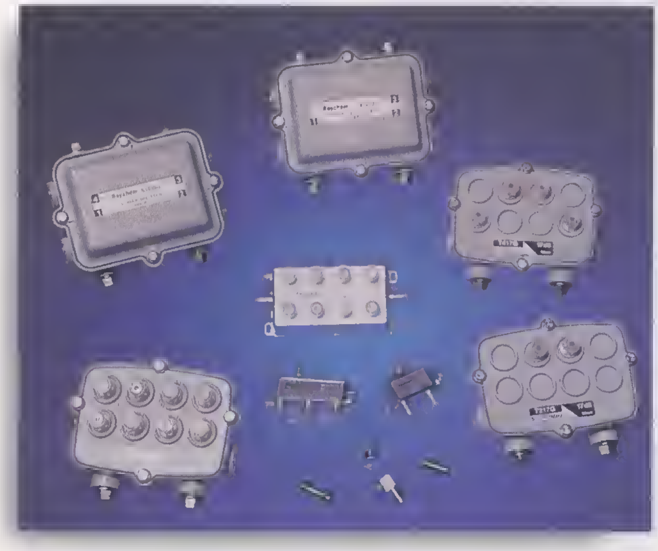
Call 216/248-0100 or circle 259

Outdoor taps

Legend Series products upgrade broadband CATV networks pushing 1 GHz performance standard. These outdoor and indoor products offer improved electrical performance to 1 GHz, network design flexibility and mechanical robustness.

The Legend outdoor taps come equipped with a RF/AC non-interrupt switch, to avoid potential signal degradation and achieve optimum RF transmission. Operators can upgrade features and conduct maintenance while manufacturing forward and reverse path integrity. The two, four and eight-port outdoor tap products come in a common housing size for easy interchange and upgrades as new services are added. The housings incorporate a woven metallic gasket to ensure 100dB minimum EMI shielding at 1 GHz. Corrosion-resistant plating protects sensitive electronics. *Raychem Corp. (Menlo Park, Calif.)*

Call 800/926-2425 or circle 260



Is Network Reliability Costing You Customers?

DPS can help!

Failures happen... but with a **T/Mon Alarm Monitoring System** loses and downtime are minimized. When an alarm is detected, the proper people are notified with clear and accurate messages. **No more lost customers** due to undetected failures.

Your business relies on equipment that MUST be up. You need a **T/Mon Alarm Monitoring System** protecting it.

Learn how telecom managers, like you, have saved time, money and manpower. **Call us now!** We'll send our Resource Guide & Video: "*The Answer to the Alarm Monitoring Puzzle.*"

☐ **Turn-key Solutions by the Experts in Alarm Management.**
☐ TL1, X.25, E2A, TBOS & ASCII plus 20 other Protocols.
☐ Scaleable Solutions from 8 Alarms to 1 Million+ Alarms.
☐ Multi user, Remote Access, Graphics, Lan and Pager Support.
☐ *New* - SNMP Support.

See us at PCS-97.

DPS INC

Call Now for Resource Guide & Video

"Your Partners in Telemetry Monitoring Systems"

(800) 622-3314 • (209) 454-1600 • FAX (209) 454-1688
Visit our Web Site http://www.dpstele.com • Email Sales@dpstele.com

Circle # 126

Don't expect to have a job in telecom in five years unless you're certified in...

Get the whole story
Get the December 15 issue

America's Network

TECHNOLOGY FOR THE PUBLIC NETWORK SINCE 1909

OTDR

The MTS 5100 field-based mini-OTDR with field-interchangeable optical modules gives fiber installers flexibility and performance to tackle any field situation in a single test platform.

Two bays accept field-interchangeable modules with varying dynamic ranges and wavelengths, as well as light source, power meter and visual fault locator options. MTS modules offer optical testing from 635nm to 1625nm, dead zones as low as 1 meter, and dynamic ranges normally expected only from a mainframe OTDR. A new generation RISC microprocessor ensures fast data acquisition and user multitasking.

The MTS provides an immediate solution as well as an upgrade path for future technologies. All OTDR modules can be equipped with an optional 635nm visual fault locator, while OTS modules offer single-mode laser source and/or power meter functions.

MTS has a rugged, water-resistant chassis that weighs less than 8 pounds when two modules are installed. An optional active matrix color screen makes results easy-to-read, even in bright sunlight. Two rechargeable NiMH batteries can be housed in the MTS chassis, providing up to 16 hours of power, while the optional universal AC charger fully recharges both batteries within two hours. *Wavetek Corp. (Indianapolis, Ind.)*

www.wavetek.com or circle 261

Net management software

The Atlas and LAS are software products ease the burden of network system administration and make network management more efficient. The Atlas data warehouse solution provides customized network status reports, enabling network managers and analysts to analyze network traffic loads and performance conditions more readily. A graphical browser presentation of network node configurations allows proactive management planning of network availability, capacity and provisioning. Atlas' integrated snapshot views assists the identification of underutilized network components.

LAS (Legacy Access System) consolidates access to more than 240 OSS applications from one workstation, simplifying and organizing system adminstration. LAS lowers overall costs by reducing the total number of workstations managed and reducing the capital burden of multiple workstations.

Pacific Access (Rancho Cordova, Calif.)

Call 800/648-6161 or circle 262

Equipment monitor

ISACC a monitor/audio dialer combines comprehensive monitoring, control and communications capabilities.

Using 16 user-defined analog/digital inputs, ISACC monitors equipment and environmental conditions, verifying proper temperature and more. ISACC embeds a C language interpreter to perform output and control. Eight digital and four analog outputs operate in response to input data to maintain proper conditions automatically.

ISACC includes a built-in modem, plus voice-synthesized alarm message capability, as well as features like data logging, networking, local and remote data programming, nonvolatile memory and a 10-15 hour battery backup.

Phonetics Inc. (Aston, Pa.)

www.phonetics-monitoring.com or circle 266

FT2ER QUAD T1
OPTICAL EXTENSIONS

THINKING ABOUT EXTENDING T1 OVER FIBER? TALK TO LARUS...

Larus FT2ER Quad DS1 Fiber Optic Extension System provides the most efficient and cost effective means of distributing T1 service to business parks, campuses and urban high rises.

- 4 T1 Line Multiplexer
- Single Mode Fiber
- Multi Mode Fiber
- 1300 nM Laser
- Protected Fibers
- 30 dB Loss Budget
- Fiber Spans to 63 kM (37 mi)
- 48 V Power
- -40ºC to +75ºC

www.laruscorp.com

QUALITY ASSURED ISO 9002 LARUS

Call Larus
800/999-9946
Larus Corporation

1560 Berger Dr. • San Jose, CA 95112

Circle # 127

Access System

The Xpress2300 access system to supports a full-duplex symmetric traffic at 1.544 Mbps (T1). The Xpress2300 also supports E1 (2.048 Mbps) and supports raw data rates up to 2.3 Mbps.

The system, provides transmission over a single copper pair, which more than doubles transmission capacity of the existing copper infrastructure, according to the company.

Xpress2300 also meets existing ETSI standards for high speed transmission over a single pair copper and is compatible with the ANSI High-Bit-Rate Digital Subscriber Line 2 (HDSL-2) standard. Xpress2300 features alarm status and power indicators and monitors performance to provide number of errored seconds and unavailable seconds as well as signal-to-noise ratio on SDSL lines. Data rates are selectable in Nx64 kbps increments.*Telmax Communications Corp. (Freemont, Calif.)*

www.telmaxcom.com or circle 251

HDSL doubler

The T-berd HDSL Doubler Supply can be used in turnup and testing of HDSL loops. The Doubler Power Supply verfies that cable pairs can support HDSL traffic and by accessing the span at the main distribution frame (MDF) and emulating the HDSL transmission unit at the CO.

Combined with the T-berd 2090SP, the system allows technicians to turn up HDSL spans and detect physical cable faults such as bridge taps, load coils and bad repeaters. Users can plug in any HTU-C card with a standard 220 back plane, making the system compatible with equipment from all major HDSL vendors. In addition, a HTU-C card performs the T1-to-HDSL conversion and supplies span power. T1 interface jacks on the front panel allow for BER testing with the T-berd 2090SP. The Doubler Power Supply combines T1, ISDN, DDS, BERT, TDR, and DVOM and is a complete tool for qualifying and troubleshooting digital loops. The T-berd 2090SP also has pre-programmed HDSL loop codes to allow span sectionalization. The instrument is battery powered, field rigged, light weight and includes automated testing. *Telecommunications Techniques Corp. (Germantown, Md.)*

www.ttc.com. or circle 253

Erbium doped amplifiers

Four erbium doped fiber amplifiers (EDFAs) are available to OEM manufacturers and system integrators. The EDFAs offer higher performance, more output power, lower noise, dual outputs and lower cost to the 1550 nm market. Products include model 9110A/B, a 16 dBm EDFA featuring improved performance in noise figure; model 9112A/B, a lower power 14 dBm EDFA; model 9120 A/B, which operates at 17 dBm and provides lower noise for certain applications; and model 9130 A/B, a 20 dBm EDFA offering higher output power performance. Each EDFA features adjustable output power over a 3 dBm range from the front panel.The 9100 EDFAs are available with or without optical isolators at the input.

Ortel Corp. (Alhambra, Calif.)

www.ortel.com or circle 267

Drop and distribution cables

A series of composite drop and distribution cables designed for simultaneous transmission of voice, video, data, and/or power in CATV and telecommunications feature low attenuation and SRL, and superior reliability. The cables are sweep-tested from 5 MHz to 1 GHz to guarantee high quality and exceptional performance. Maximum near-end crosstalk (NEXT) on all cables is 44dB/1,000 ft. and maximum far-end crosstalk (FEXT) is 63dB/1,000 ft.

The family includes the following standard products:

- Part No. 6DEOA—For use in building interiors, this cable features a Series 6 Duobond II 60% aluminum braid core with two pairs of 24 AWG solid copper, polypropylene-insulated UTP conductors, in a Siamese (parallel)-type construction.
- Part No. 6DE5C—For underground CATV and telephone applications, this cable features a Series 6 Duobond II 60% aluminum braid coax core with two pairs of 24 AWG solid copper, polypropylene-insulated UTP conductors in a Siamese (parallel)-type construction.
- Part No. 6QAOB—For aerial CATV, telephone and power distribution applications, this cable features a Series 6 Duobond II Quad Shield coax core with two pairs of 22 AWG solid copper, polypropylene-insulated UTP conductor, in a Siamese (parallel)-type construction.
- Part No. 1QC5A—For underground CATV and telephone applications, this cable features a Series II Duobond IBV Quad Shield coax core with five pairs of 22 AWG UTP solid copper, polypropylene-insulated conductors in a Siamese (parallel)-type construction.

Belden Wire & Cable Co.
(Richmond, Ind.)

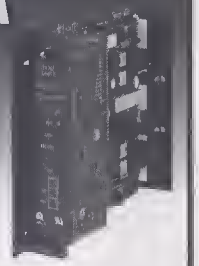
www.belden.com or circle 255

Scope meter (PIX)

The Fluke 123 Industrial ScopeMeter combines scope, meter and recorder capabilities in one unit. Technicians can check and troubleshoot AC and DC motor drives, sensors and attenuators, line voltage, transformers, converters, and analog and digital control loops. The 2.5 lb. meter measures 2" x 4.5" x 9.1" and carries a three-year warranty.

Specialized Products Co. (Irving, Texas)

www.specializedproducts.com or circle 268



DS1 Connector
T1 Network Interface

MODEL
LA411

The Larus LA411 provides circuit demarcation and network interface capability to North American Standard T1 1.544 MB/S PCM carrier facilities terminated on customer premises. Designed for 400 card mechanics, the Model LA411 is inband or ESF controlled.

The Model LA411 provides network and CPE loopback, line or local powering, looping of facility span simplex power, a dry or wet customer interface and shielded circuitry. The span receive circuit range is up to 4500 feet.

QUALITY ASSURED ISO 9002 LARUS

Call Larus
800/999-9946
www. laruscorp.com
® Larus Corporation

1560 Berger Dr. • San Jose, CA 95112

Circle # 128

Monitoring application

MartisDXX NMS Release 9.0 incorporates enhanced functions for partitioning and circuit fault monitoring, as well as support for hardware modules within the MartisDXX system. Release 9.0 includes network views that allow operators to prioritize certain customers or critical circuit types. A new circuit fault managing facility allows the network operator or VPN (virtual private network) user to categorize services, for example, by services type or customer, so that fault monitoring may be carried out independently of other categories. The new release also supports additional fault filtering functions, including general format filter, network element specific fault filters and fault reclassification.

The MartisDXX NMS provides end-to-end centralized or distributed control of a MartisDXX network, from the backbone transport network to the customer premises.

Tellabs (Lisle, Ill.)

www.tellabs.com or circle 263

Winch facts

A six-page brochure presents distinctive features, operating specification, hydraulic system requirements and benefits of the Adams CD3 Winch for placing standard heavy-duty cable, and the reduced-weight CD Lite Winch for innerduct ad fiber/coax broadband cable. Both winches feature compact, rugged construction.

The brochure also includes photographs of each winch, technical drawings (side, front and top views), and graphs of line speed and line pull. Separate sections describe GMP's UV-25 and UV-7.4 Universal Swivel Sheaves, which provide long service as accessories with the winches.

General Machine Products Inc. (Trevose, Pa.)

www.gmptools.com or circle 269

Subgrouping fiber cables

Tight-buffered GX Series Subgrouping fiber optic cables can be manufactured with 12 to over 800 multimode and/or singlemode fibers separated into small subgroups within a single cable outer jacket. These cables can be manufactured for riser or plenum specifications in order to meet most indoor and outdoor cable applications. The "installer friendly"cable design provides fiber count cabling to multiple destinations within a facility. Since these tight-buffered cables contain no gel-filling, they can easily be terminated easily, allowing for reduced labor, equipment and material costs while improving system performance and reliability.

OpticalCable Corp. (Roanoke, Va.)

Call 540/265-0690 or circle 258

Line test set

The Amrel Telesense 2500 Handheld Transmission Line Test Set tests frequency from 20kHz, level to 200 kHz, and noise using "C," or "E," "F" filters, each with True RMS detection. The system also includes digital multimeter testing. It measures resistance (to 20 kilohms for loop resistance and to 2 Megaohms for insulation resistance); DC volts; AC volts (with True RMS detection); and DC amps (to 200 milliamps).

Field technicians can recognize Level and Noise on a 2-wire or 4-wire circuit, even at 200 kHz. The tester quickly clears the line, so efforts can be concentrated on CPE, when problems occur more than 70% of the time.The Telesense 2500 is light weight and passes the 4-foot drop test. A front dial allows for easy movement from one test to another.

Amrel/American Reliance Inc. (Arcadia, Calif.)

www.amrel.com or circle 252

Field computer

The FC-PX5 field computer includes a unique form factor for easy outdoor operation, solid-state mass storage, a high-performance 133 MHz processor, rugged backlit monochrome LCD and advanced power management system, and is available with Windows 3.1 or Windows 95. Advanced battery management features allow a full day's work using a single battery. Rotating disk drives are replaced with up to 150 Mb of solid-state storage from SanDisk. *Husky Computers Inc. (Clearwater, Fla.)*

www.huskyinc.com or circle 271

Residential gateway

The N3 Residential Gateway provides a single interface for multiple communciations streams into the home, including telephony and data/Internet services, as well as analog and digital video. The gateway is based on a modular architecture; subscribers can add plug-in cards for additional functionality, such as data communications via an Ethernet connection, Internet access and voice applications. The gateway supports multiple analog television sets through use of optional MPEG plug-in cards. The gateway's bus structure allows simultanoues transport of voice, video and data using ATM technology for delivering cells from the wired network interface to the primary video decoder and Ethernet driver.
Next Level Communications, a subsidiary of General Instrument (Chicago)

www.gi.com or circle 272

Real-time diagnosis

The InCharge Event Correlator software package, based on codebook correlation and object-oriented diagnostic modeling, identifies the root cause of network, system and application problems in seconds. The software automatically computers optimal problem "codes" specific to each networked system from diagnostic models and topology; codebook correlation then becomes a fast comparison of monitored data and events to problem codes. Because codes contain redundant symptoms, lost events and false alarms do not affect accuracy of the results. The package supports SNMP, CORBA and proprietary data and event sources, and features a Web/Java-based graphical user interface. The software is available for Sun Solaris, HP-UX and Windows NT platforms. *System Management ARTS (White Plains, N.Y.)*

www.smarts.com or circle 273

Services testing

Enhancements to the Hammer IT test system add capacity, reduce cost and provide new features, such as facsimile transport. The unit can support as many as 60 simultaneous ports of fax transmission, making it suitable for load, feature, regression and in-service testing. A software-based, entry-level prompt recognition option is cost-effective for systems needing small amounts of recognition.
Hammer Technologies (Wilmington, Mass.)

Fax 508/988-0148 or circle 252

ATM clock, data recovery

The T-2044 voltage-controlled crystal oscillator (VCXO) is used in ATM phased locked loop circuits that recover clock and data signals from noisy transmissions.The unit combines advanced electrical specifications (±20 ppm stability and ±150 ppm capture range) with significant thermal and mechanical characteristics that enhance reliability, shrink board real estate, cut enclosure size and simplify surface-mount PCB manufacturing and testing. An internal 0.1µF bypass capacitor sharpens the oscillator's output waveform to minimize triggering uncertainty. Jitter on the output waveform is <35 picoseconds peak-peak typical, 60 ps maximum. Output symmetry is at least 45/55. The T-2044 operates on 5 volts ±5% DC power with a current draw of less than 30 mA.
MF Electronics Corp. (New Rochelle, N.Y.)

mfsales@mfelec.com or circle 274

GIS data retrieval

Matador brings full functionality of the Logic/GIS system into a client-server, open object-oriented API, Oracle and SQL server-based environment. Matador simultaneously provides full-featured functionality for multiple users, speedy data retrieval from large data sets, versioning support of long transactions, and an API for custom software development. Data versioning gives all users access to all GIS data all of the time, and transparently manages conflicts, including work-order dependencies, keeping the integrity of the data set intact. The API can be accessed by other programs writteen in any computer language, residing on different computers and platforms that communicate over LANs or WANs. The program supports various outside plant applications, including broadband and copper design, work order management, and engineering funtions.
Cadtel Systems Inc. (Phoenix, Ariz.)

Circle 275

Each and every month America's Network brings to you an up-to-date selection of products, services, seminars and career opportunities in our *Career & Development Showcase* and *Products and Services Showcase*. Check it out every month!

America's Network

FOR ADVERTISING INFORMATION AND AD PLACEMENT, CONTACT:
Denise Kokai, 216-891-3163
1-800-225-4569 (ext. 163)
Fax 440-826-2865
dkokai@advanstar.com

For all ads under $250, payment must be received by the classfied closing date. VISA, MASTERCARD, AMERICAN EXPRESS accepted. **Send ad copy to:** Advanstar Marketing Services, 7500 Old Oak Blvd., Cleveland, OH 44130.
Send blind box replies to: America's Network Classified, 131 W. First St., Duluth MN 55802 (include box number in address).

CAREER & DEVELOPMENT

HOT JOBS
IMMEDIATE TELECOM OPENINGS

- TOP PAY UP TO 60 HOURS PER WEEK, LONG TERM POSITIONS
- CABLE SPLICERS NEEDED FOR TX, NV, OK
- I&R TECHNICIANS NEEDED FOR TX, NV, OK, MD, NORTHERN VA
- WITH TRUCK AND TOOLS OR TRUCK AND TOOLS PROVIDED.
- OUTSIDE PLANT ENGINEERS WITH PRIOR TELEPHONE EXPERIENCE IN AERIAL, BURIED AND UNDERGROUND EXPERIENCE NEEDED FOR LAS VEGAS NV, NORTHERN VA, EL PASO, TX, TN, NY, CA, KY & PA

FOR IMMEDIATE CONSIDERATION.

Call OSP Consultants, Inc.
@1-800-444-1400
http://www.osp.com
Fax resumes
@ 1-800-677-6078

osp consultants, inc.
TELECOMMUNICATIONS ENGINEERING AND CONSTRUCTION

21400 Ridgetop Circle, Suite 101
Sterling, VA 20166-6511
Tel: 703-444-1400
Fax: 703-444-0356 *EOE*

VP MARKETING

New position created for the seasoned marketing executive with a long established leader in data transmission products. The preferred candidate will have both EE and MBA degrees and have 3+ years experience in a senior R&D position and 5+ years in a senior marketing management position. Must be expert in all data transmission technologies including Frame Relay, ISDN, T1 and DSL.

Candidates must have experience in selling and developing markets with RBOCs, Independents, CAPs and have proven experience in developing CPE, International and OEM markets. The successful candidate will become a member of the Executive Committee and will participate in all product and market development planning.

Competitive salary, excellent benefits and opportunity to join a well positioned company poised for dynamic growth.

SEND RESUME IN CONFIDENCE TO:

CONKLIN
BOX 650, WEST ROAD
PLEASANT VALLEY, NY 12569

BUTLER TELECOM

IMMEDIATE OPENINGS NATIONWIDE

CENTRAL REGION	800-365-9675

RF Testers/Engineers, PCS/ Cellular, Satellite and Microwave Technicians

PACIFIC REGION	800-422-4730

Splicers, OSP Engineers, I&R Technicians, RF Testers/ Engineers

NORTHEAST REGION	800-345-4491

C. O. Engineers & Frame Administrators

SOUTHEAST REGION	800-241-6220

Project/Product Managers, COE Maintenance Technicians

IN, OH, IL, MI	800-888-8412

RF Testers/Engineers, Power Systems Installers, Technical Support Engineers.

COE Installers, Engineers and Testers needed in all regions.

EOE M/F/V/D

Subscription Questions? Call 800-346-0085, ext. 477

The Benefits Of CLASSIFIED ADVERTISING

IMPACT
Command immediate attention and get fast action with the dynamics of classified advertising!

EXPOSURE
Reach highly-targeted, market-specific businessprofessionals, industry experts and prospects.

VALUE
Select from a variety of classified display options to meet specific needs on a timely basis cost-effectively.

RESULTS
Generate sales leads, maintain market presence, conduct market testing, promote existing lines, introduce new products and services, or recruit the best — bottom-line, classifieds offer you an excellent return on investment!

ADVANSTAR
COMMUNICATIONS
MARKETING SERVICES

7500 Old Oak Blvd.
Cleveland, OH 44130

America's Network
DIRECT MAIL

List

targeted, influential audience:

- ▶49,067 decision makers
- ▶Highly responsive
- ▶98% deliverable guaranteed
- ▶Selects available

FOR DETAILS CONTACT
Anita Knight
440-891-3172

CAREER & DEVELOPMENT

COMMUNICATIONS TECHNICAL TRAINING

"Training Increases Productivity"

- Transmission
- Power
- Monitoring
- Standard & Custom Courses

Structured learning environment, hands-on applications, personalized attention and effective task-based course materials. Call toll-free to receive a FREE catalog of detailed course descriptions.

(800) 398-8867

RELTEC™

America's Network

'97 Issue	Highlights • Show(s)	Closing
November 1	Switching Technologies • ALTS	Oct. 1, 1997
November 15	Testing & Monitorin	Oct. 15, 1997
December 1	Broadband Communications • Western Cabl	Nov. 3, 1997
December15	Power & Protectio	Nov. 14, 1997

TO PLACE YOUR AD IN THE NEXT ISSUE OF AMERICA'S NETWORK

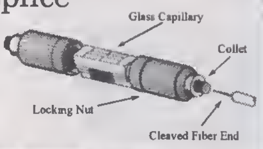
Contact:
Denise Kokai
440-891-3163,
Fax 440-826-2865
Email dkokai@advanstar.com

PRODUCTS & SERVICES

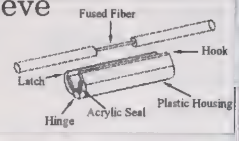
FIBER OPTIC SPLICING

Fiber Optic Splicing Products

ULTRAsplice
Mechanical Reusable & Tunable Splice



ULTRAsleeve
Mechanical Fusion Splice Protection Cover



Advanced Custom Applications

Call: (908) 281-0353 *or*
(888) ACA-SPLICE
Internet: http://www.aca-inc.com

Classified Works!

OPPORTUNITIES

ACQUISITIONS DESIRED

Butler Telecom, a nationwide telecommunications services leader is looking to expand its services and infrastructure with acquisitions across the continental U.S. Butler is interested in acquiring the following types of service companies:

- Central Office Engineering & Design
- Central Office Installation & Maintenance
- Wireless Engineering, Design & Installation
- Telecom & IT Staffing
- Broadband Engineering & Design

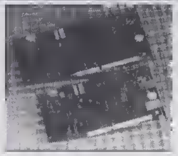
Call Bob Murphy with Elite Investment Group, LLC in complete confidence at 201-476-5406.

BUTLER International
NASDAQ NMS: BUTL

PRODUCTS & SERVICES

PRODUCTS & SERVICES

PC BASED T1/E1 TESTING & ANALYSIS



- Full/Fractional & Framed/ Unframed Multi T1/E1 BERT w/Drop & Insert utilizing PC expansion slots
- DTMF/MF, Signaling Bits & Call Recording Analysis
- Record/Playback to/from PC files
- Audio Monitoring & Insertion for any selected DSO
- Direct T1/E1 Fax Call Monitoring
- Time & Spectral Displays of DSOs
- D-Channel Protocol Analysis
- Scripted Control and Programmer's Manual for Customization

GL COMMUNICATIONS INC.
841-F Quince Orchard Blvd.
Gaithersburg, MD 20878
Tel: 301-670-4784 • Fax: 301-926-8234
E-mail: gl-info@gl.com/glcomm/

America's Network

FAST ACTION POSTCARD DECK

DECK MAILS
MARCH
MAY
SEPTEMBER

A highly targeted and cost-efficient direct response card deck reaching over 50,000 decision makers throughout the new public network!

CONVENIENT & EASY TO USE— IDEAL FOR

- ■ Generating sales leads ■ Distributing special offers ■ Testing product ideas
- ■ Testing price points ■ Promoting new or existing products and services
- ■ Inviting attendees to trade shows, seminars, conferences

America's Network handles all the details — printing, mailing and postage. Each card in the deck is self-contained, featuring your ad on one side and your business reply address on the other. Leads are mailed directly to you for immediate sales follow-up. It's that easy and convenient!

FOR COMPLETE CARD DECK INFORMATION CONTACT:
DENISE ADKINS-KOKAI • 800-225-4569 EXT. 163 • 440-891-3163
FAX: 440-826-2865

SOFTWARE

S.A.M.

Service & Accounting Manager Interconnect Software

- ☎ Service Dispatching
- ☎ Tracking & Billing
- ☎ Maintenance Agreement
- ☎ New Installations
- ☎ MAC's Quote & Billing
- ☎ CAR-Inventory
- ☎ PO's & Mat. Requirements
- ☎ Accounting A/R, A/P, G/L
- ☎ Sales Leads and Human Resources
- ✓ Multi-User Novell, Windows Nt, UNIX, IBM AS/400, RS/6000
- ✓ Free Hardware & Networking Consulting
- ✓ Free one year Tel. Support
- ✓ Most Complete, Integrated, System in operation since 1985

Try S.A.M.'s On-Line Presentation, use your Data. Compare S.A.M.'s to your current system before you decide.

1-800-736-3934
http://www.sac-sam.com
info@sac-sam.com
VARS & DEALERS INQUIRIES INVITED

SAC
Software Analysis Consultants Inc.

INFORM ◆ INTRODUCE ◆ INFLUENCE ◆ INSTRUCT

CUSTOM REPRINTS

Reprints are highly effective when you use them to:

- ◆ Develop direct-mail campaigns
- ◆ Provide product/service literature
- ◆ Create trade show distribution materials
- ◆ Present information at conferences and seminars
- ◆ Train and educate key personnel, new hires
- ◆ Enhance press kits
- ◆ Compile reference materials
- ◆ Track trends and emerging technologies

America's Network

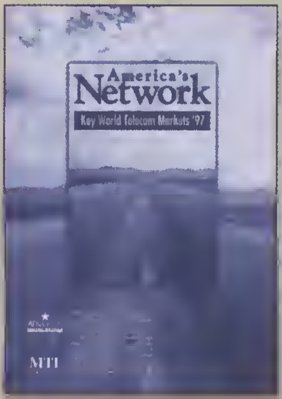
BRIAN KANABA
ADVANSTAR MARKETING SERVICES
1-800-225-4569 ext. 155
440-891-3155
Fax: 440-826-2865

Contact Denise Adkins-Kokai for great advertising opportunities in

AMERICA'S NETWORK

440-891-3163 • Fax 440-826-2865

Staying on Top Requires Superior Intelligence



Staying on top of the changes occurring in today's global, highly competitive telecommunications industry requires superior intelligence.

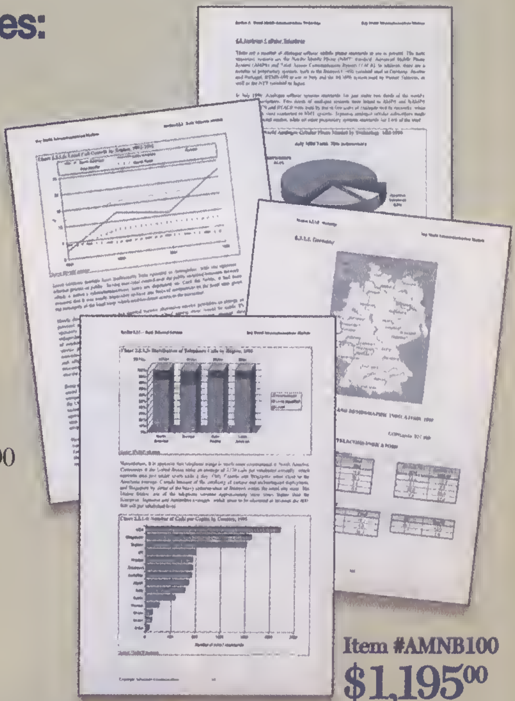
Introducing…*Key World Telecom Markets 1997/1998*

America's Network, *Communicaciones*, and *Asia Telecom* magazines have teamed up with Market Tracking International, a leading international research firm, to bring you the most comprehensive and up-to-date single volume of information on the telecom market today.

Key World Telecom Markets 1997/1998 contains more than 500 pages of detailed global analysis, including 150 statistical charts and tables to help keep you and your company tuned into your competition and on top of potential opportunities worldwide.

Key World Telecom Markets 1997/1998 features:

- A thorough, international industry overview
- Analysis of market share, growth rate, and cross-country and cross-company comparisons
- Market sector analysis
- An in-depth look at global telecom policy issues
- Overviews of the latest in mobile telephone technology
- Detailed country profiles on 15 of the world's most dynamic telecom markets:
  - Complete market overview for each country, including major political and economic developments
  - In-depth reports on each country's primary regulating authority, recent regulatory changes, and regulatory plans into the year 2000
  - Market structure analysis for each country's service markets, including infrastructure, finance, pricing, and market share
  - Corporate strategy insights for each country's primary operators and other players
- Over 70 pages of in-depth analysis on the US telecom market
- And much more



Item #AMNB100
$1,195^{00}

Visit our website at www.americasnetwork.com to learn more about *Key World Telecom Markets 1997/1998*

Call 1-800-598-6008 • Outside the U.S. 218-723-9180 • Fax 218-723-9146
Advanstar Marketing Services • Customer Service Dept. • 131 W. 1st St. • Duluth, MN 55802

CODE: 950121

AMERICA'S NETWORK CUSTOMER SERVICE

PUBLISHER
Paul Semple
312 W. Randolph St., Suite 600
Chicago IL 60606-1721
☎ 312/553-8920
fax 312/553-8926
psemple@americasnetwork.com

GENERAL MANAGER
Danny Phillips
201 Sandpointe Ave., Suite 600
Santa Ana, CA 92707-8700
☎ 714/513-8466
fax 714/513-8634
dphillips@americasnetwork.com

ADVERTISING PRODUCTION MANAGER
Julie Koerber
Send ad materials to:
201 Sandpointe Ave., Suite 600
Santa Ana CA 92707-8700
☎ 714/513-8408
fax 714/513-8693
jkoerber@advanstar.com

www.americasnetwork.com

FOR EDITORIAL CONTACT INFORMATION: See page 4.

Editorial submissions: Send press releases and other information to the Santa Ana, Calif. address. All submitted material will be handled with reasonable care; however, *America's Network* assumes no responsibility for safety of submitted artwork, photographs or written material. Materials accepted for publication will not be returned. To obtain guidelines for contributed information and manuscript proposals, call Rebecca Ittner at 714/513-8422.

Descriptions of commercial products and services are at times based in part on information supplied by vendors. *America's Network* assumes no responsibility for any false or misleading claims that may appear in vendor-contributed descriptions.

ADVERTISERS' INDEX

Advertiser	Page	RS#
3m Telecom www.mmm.com/telecom	11	104
ADC Telecommunications www.adc.com	17	106
Advanced Fibre Communications www.fibre.com	9	103
Cerjac Telecom Operations —	51	121
Channell Commercial Corp. www.channellcomm.com	34	112
Channell Commercial Corp. www.channellcomm.com	35	113
Charles Industries www.chasind.com	47	120
Ciena www.ciena.com	Cv4	130
C.I.S. Inc. www.cisfocus.com	57	125
Corning Inc. r&drecruit@corning.com	53	123
DPS Inc. www.dpstele.com	59	126
DSC Communications Corp. www.dsccc.com	14–15	105
Electrodata www.electrodata.com	21	108
Ericsson Network Systems www.ericsson.com/cobra	Cv2	100
Fujitsu Network Transmission fast@fujitsu-fnc.com	6–7	102
Hekemian Laboratories —	25	131
Hitachi Software www.hitachisoft-co.com	55	124
Hitachi Telecom (USA) Inc. www.hitel.com	26-27	110
Intelect Inc. www.intelectinc.com	39	115
Larus Corp. www.laruscorp.com	52	122
Larus Corp. www.laruscorp.com	60	127
Larus Corp. www.laruscorp.com	62	128
Network Construction Svcs. —	44	117
Pacific Access www.pacacc.com	23	109
Positron Fiber System —	19	107
Professional Systems Inc. —	45	119
RAD Data Communications market@radusa.com	31	111
Reef Industries Inc. www.reefindustries.com	5	101
Reltec Corp. www.relteccorp.com	41	116
Sunrise Telecom Inc. support@sunrisetel.com	Cv3	129
Tandem Computers www.tandem.com	36-37	114
Wilcom Inc. www.wilcominc.com	45	118

The advertisers' index is provided as an additional service. The publisher does not assume any liability for errors or omissions.

ADDITIONAL SERVICES

To purchase issues, call toll-free:
800/346-0085, x477 (outside the U.S.: 218/723-9477).
- Single copies: $4.95 (U.S.); $5.95 (Canada & Mexico); $7.95 (all other countries).
- All rates include shipping & handling, and are payable in U.S. funds drawn on a U.S. bank.

To subscribe, call toll-free:
800/346-0085, x. 477 (outside the U.S.: 218/723-9477).
Subscription rates:
- U.S. & Territories: one year $44; two years $64
- Canada & Mexico: one year $64; two years $114
- All other countries: one year $84; two years $154 *(incl. $95/year extra for air-mail delivery)*

To order reprints (100 minimum), call:
Brian Kanaba at 216/891-3155; fax 216/826-2865

To obtain microform copies (film or fiche), call:
Marketing Services at 800/225-4569, x839.

For list rentals, call: Anita Knight at 216/891-3172; fax 216/826-2865

For classified ad, directory, buyers guide and postcard information, call: Danielle Gundling at 216/891-3153; fax 216/826-2865

America's Network (ISSN-1075-5292, USPS 576-650) is published the 1st and 15th of every month by Advanstar Communications Inc. Corporate offices: 7500 Old Oak Blvd., Cleveland OH 44130. Advertising offices: 7500 Old Oak Blvd., Cleveland OH 44130 and 312 W. Randolph St., Chicago IL 60606. Accounting & circulation offices: 131 W. First St., Duluth MN 55802.

Copyright © 1997 by Advanstar Communications Inc. All rights reserved. No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including by photocopy, recording or information storage and retrieval system, without permission in writing from the publisher. Authorization to photocopy items for internal or personal use, or the internal or personal use of specific clients, is granted by Advanstar Communications for libraries and other users registered with the Copyright Clearance Center, 222 Rosewood Dr., Danvers MA 01923; ☎ 508/750-8400; fax 508/750-4470; call for copying beyond that permitted by Sections 107 or 108 of the U.S. Copyright Law. For those not registered with the CCC, forward permission requests in writing to Maureen Cannon, Advanstar Communications Inc., 7500 Old Oak Blvd., Cleveland OH 44130.

Canadian G.S.T. number R-124213133. IPM Number 841773.

Office of Publication: Advanstar Communications Inc. 131 W. First St., Duluth MN 55802. Periodicals postage paid at Duluth MN 55806 and additional mailing offices.

POSTMASTER: Send address changes to America's Network, P.O. Box 6100, Duluth MN 55806.
Date: Jan. 28, 1994. Printed in the U.S.A.

ISSN-1075-5292 (USPS 576-650)

COMING UP...

October 1
Switched Video/Research & Development

October 15
TQM/ISDN

November 1
Switching Technologies/Storage

November 15
Testing & Monitoring/Bridges & Routers

December 1
Broadband Communications

December 15
Power & Protection/Career trends in telecom

ADVERTISING SALES STAFF

UNITED STATES

WEST
Bob Kirstine
Leah Vickers
Kimberly Daniels

Kirstine & Co. Inc.
6615 E. Pacific Coast
Highway, Suite 285
Long Beach, CA 90803
☎ **562/493-5434**
fax 562/493-1564
rkirstine@earthlink.net
lvickers@earthlink.net
kimdaniels@earthlink.net

Bob Ohlsen

America's Network
7500 Old Oak Blvd.
Cleveland, OH 44130
☎ **216/891-2682**
fax 216/891-3120
bohlsen@americasnetwork.com

NORTHEAST
Karen Smith

KCS International
94 Newport Road
Leola, PA 17540-1821
☎ **717/656-4330**
fax 717/656-4643
karenkcs@aol.com
AOL: Karen KCS

INTERNATIONAL

ASIA & PACIFIC RIM
Gigi Chan
CCI Asia-Pacific Ltd
Unit 101
1/F, Pacific Plaza
410 Des Voeux Road West
Hong Kong
☎ +852-2858-0789
fax +852-2857-6309
telecomasia@cci.com.hk

FRANCE, LUXEMBOURG, BELGIUM, NETHERLANDS
Stephane de Remusat
REM International
24 Bis Rue Gallieni
91560 Montmorency
France.
☎ +33-1-39-89-9600
fax +33-1-39-89-6341
srem@compuserve.com

GERMANY, AUSTRIA, SWITZERLAND
Friedrich Anacker
Susanne Janzen
Sven Anacker
InterMedia Partners GmbH;
Deutscher Ring 40
43247 Wuppertal, Germany
☎ +49-202-271-690
fax +49-202-271-6920
mail@impgmbh.de

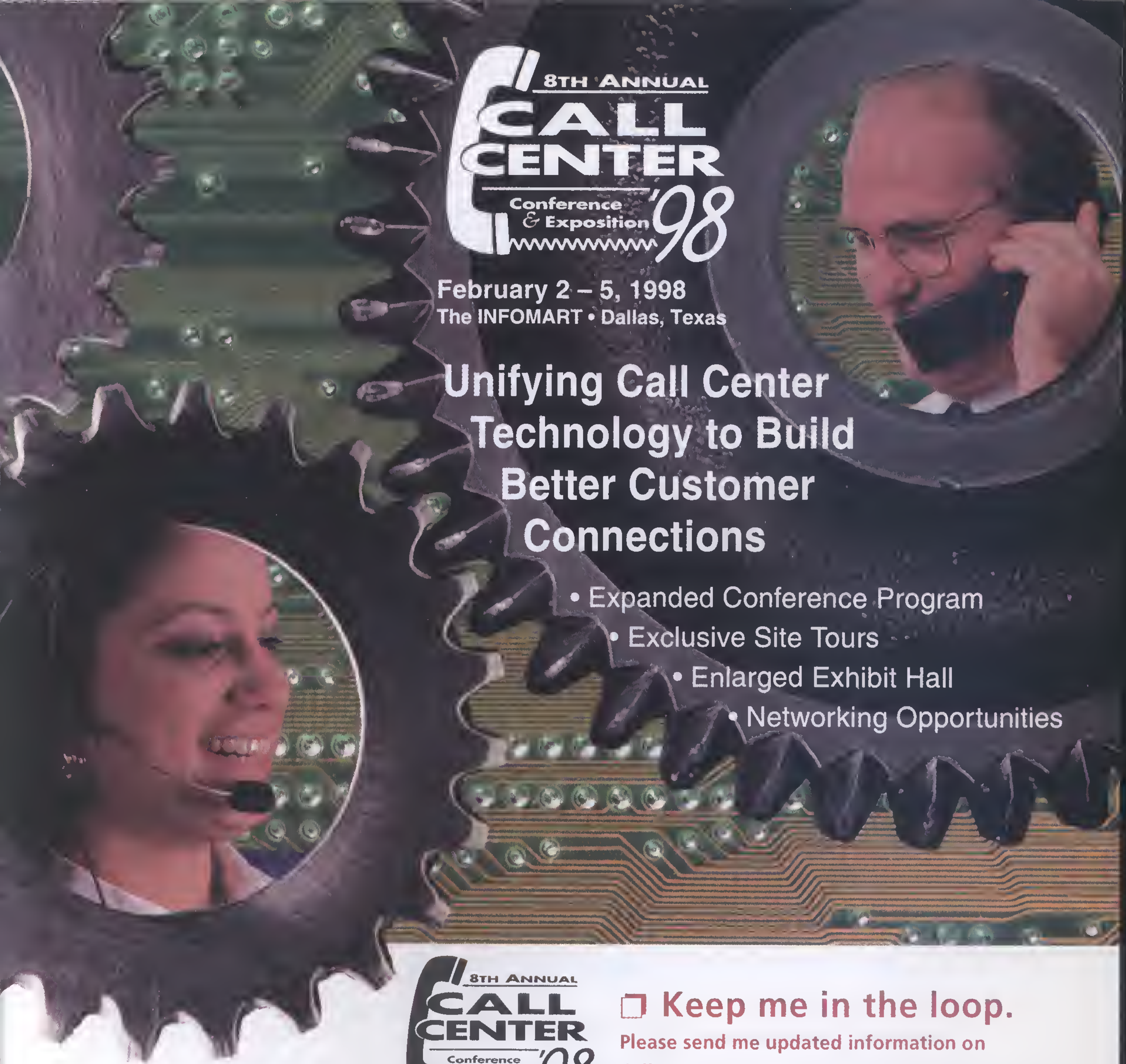
ISRAEL
Marcus Sheff
Intermedia, The World Shop Ltd.
P.O. Box 3348
Ramat Gan 52133
Israel
☎ +972-3-5754426
fax +972-3-7510687

JAPAN
Eigi Yoshikawa
EMS Inc.
2-28-11-204-Matsurbara,
Setagaya-ku
Tokyo 156, Japan
☎ +81-3-3327-2688
fax +81-3-3327-3010
callems@msn.com

KOREA
J.S. Suh
Hau international
CPO Box 4072
Seoul, Korea
☎ +82-2-7200-121
fax +81-2-7200-122
hauintl@chollian.dacom.co.kr

SCANDINAVIA
Michael Karnig
Anette Ericksson
Andrew Karnig & Associates AB
Finnbodav 29 S-131
31 Nacka, Sweden
☎ +46-8-442-7050
fax +46-8-442-7059

UNITED KINGDOM
Dee Wakefield
Advanstar Communications
1a Gregory Place
Kensington; London W8 4NG
England
☎ +44-171-938-1199
fax +44-171-938-4555



8TH ANNUAL
CALL CENTER
Conference & Exposition '98

February 2 – 5, 1998
The INFOMART • Dallas, Texas

Unifying Call Center Technology to Build Better Customer Connections

- Expanded Conference Program
- Exclusive Site Tours
- Enlarged Exhibit Hall
- Networking Opportunities

8TH ANNUAL
CALL CENTER
Conference & Exposition '98

☐ Keep me in the loop.

Please send me updated information on Call Center '98

I'm interested in: ☐ Attending ☐ Exhibiting

For information about corporate sponsorship opportunities call David White or Cass D'Arlon at (800) 854-3112 or (714) 513-8400

First Name__________ Last Name__________

Title__________

Company__________

Address & Mail Stop__________

City__________ State/Prov ____ Zip/Postal Code ______

Country__________

Telephone___ - ___ - ____ Fax ___ - ___ - ____

E-Mail Address__________

Who is your approving manager?__________ 40

☎ Call
(800) 331-5706 or
(218) 723-9130
to request
your brochure.

FAX
Fax this
completed
form today!
(218) 723-9122

Detach form and
mail it today!
Call Center '98
P.O. Box 6429
Duluth, MN
55806-6429

Produced by
ADVANSTAR EXPOSITIONS

ALAN PEARCE

The FCC's silver lining

Court emphasizes agency's regulating power.

The commission still can flex its muscle to make sure local competition comes quickly, effectively and efficiently.

Setbacks on the road to competition may be commonplace at the Federal Communications Commission, but while the FCC may be down temporarily, it certainly is not out.

Most "experts" say the 8th Circuit Court of Appeals ruling will "significantly" slow down introduction of competition in local markets. While the FCC and/or other parties will appeal the decision to the Supreme Court, incumbent local exchange carriers (ILECs) and new competitive local carriers are pondering the impact of the decision on their business plans.

The court said the FCC does not have authority to issue pricing guidelines for local telephone markets, under congressional legislation adopted last year. That authority, according to the court, rests with state regulators, not the FCC. The commission had maintained that it has "parallel" jurisdiction.

THE BLOW TO THE INCUMBENT CARRIERS

Interestingly, the court found no fault with the FCC's controversial methodology for determining prices for local intrastate services (namely, the total element long run incremental cost, or TELRIC). This is a major blow to the ILECs, which claimed the methodology mandated they price below cost.

Emphasizing the continuing importance of the FCC as an ongoing regulator, the court ruled that the FCC has significant involvement in local competition, but is restricted to:

- Number portability and numbering administration;
- Prevention of discriminatory conditions on resale;
- Unbundled network elements;
- Continued enforcement of exchange access; and
- Treatment of comparable carriers as incumbents.

The court also left intact key elements of the commission's original policy of August 1996, namely that:

- ILEC discounted and promotional rates extending beyond 90 days should be made available at wholesale rates to resellers;
- New entrants do not need to provide their own facilities to access unbundled network elements; and
- ILECs must provide competitors with unbundled access to operations support systems, operator services, directory assistance and vertical switching features.

It seems that the FCC has not lost much after all. Even if we ignore the fact that an increasing number of states are assiduously adopting essential elements of the FCC's local competition policy, the commission can still flex its muscle to make sure local competition will come quickly, effectively and efficiently.

Two recent actions illustrate this point:

- The pro-competitive imperatives agreed to by Bell Atlantic and Nynex as a pre-condition for FCC approval of their merger; and
- The rejection (again) of Ameritech's 14-point competitive checklist compliance plan. To date, not one regional Bell has had its compliance plan approved by the FCC—resulting in serious, federally imposed, regulatory and competitive constraints on the nation's major incumbent carriers.

In return for FCC approval, the merged Bell Atlantic-Nynex agreed to rigorous steps the agency says will make it easier for carriers—such as AT&T, MCI-BT, Sprint-DT-FT, Worldcom-MFS-UUNet, to name a few—to begin offering local service in the expanded Bell Atlantic-Nynex region. The FCC will be keeping close regulatory scrutiny over the merged carrier for at least the next three years.

Regarding Ameritech's ambitious plans to be the first regional Bell entering the long-haul market, the FCC continues to say "no way," until Ameritech opens up its local exchange monopoly to competition. Until then, the carrier's 14-point competitive checklist compliance plan will continue to be denied.

Remember: until a competitive compliance plan is approved in each state, there is indeed "no way" for a regional Bell to offer long distance in its multi-state territory.

So, who is the victor? Not the incumbent carriers. They remain stringently (perhaps even stridently) regulated, and still cannot enter service markets they deem essential for long-term survival.

The FCC is down, but not out. When the policy, political and business dust settles, the commission indeed will have a pro-competitive victory to celebrate.

Alan Pearce is president of Information Age Economics Inc. (Washington, D.C.). He can be reached at 202/466-2654.

SONET Made Simple.

Just because SONET is complex doesn't mean that SONET testing needs to be. If only there were a test set built for everyday SONET use . . . and you could afford to equip your whole staff with one.

There is. You can.

All the most-needed SONET testing functions are right at your fingertips with the SunSet™ STS-1. It's the only handheld test set that offers DS1, DS3 and STS-1 electrical interfaces in one compact package. Full internal multiplexing support gives you the flexibility to test different types of circuits from different ports: for instance, access a VT1.5 channel from the STS-1 port to loop back a DS1 NIU at a distant location, or test a 3x1 cross-connect system from a DS3 port to a DS1 port. You can also test and emulate a multiplex, drop individual tributary signals, and do DS3/DS1 bit error rate testing. Even view and transmit SONET overhead information for precise diagnostics.

At under 3 pounds, the SunSet STS-1 travels effortlessly to every point in your network, from central office to customer premises. The graphic display gives you immediate visibility of instrument setup, allowing you to diagnose more accurately and troubleshoot more quickly. Intuitive, easy-to-use controls put the unit to work for you right out of the box. You can upgrade to new capabilities in the field without factory returns or tools, using SunWare™ cartridges. And for less than half the cost of comparably-equipped sets, you can justify putting essential SONET testing power in the hands of every field technician.

Cost-effective SONET testing in a convenient handheld instrument? It couldn't be simpler. Call us today for more information and a demonstration of the SunSet STS-1.

SUNRISE TELECOM
INCORPORATED
. . . a step ahead

22 Great Oaks Boulevard, San Jose, CA 95119 U.S.A.
1-408-363-8000 fax 1-408-363-8313
Internet: support@sunrisetel.com

Circle 129

Words You Will Never Hear

"Oh, you're late for work? Let's forget the ticket."
"I have enough bandwidth."
Come See Us At:
NFOEC '97
—San Diego, Sept. 21-25—
Booth #421

40Gb/s Today!

Fiber networks are already overcrowded. And new services are coming online. What to do? Maximize your bandwidth with CIENA. Our family of fiber optic solutions enables carriers to exploit their bandwidth, improve network reliablity and reduce costs. Call 410-865-8500 or visit us at www.ciena.com.

CIENA®
The Bandwidth Standard

Circle 130

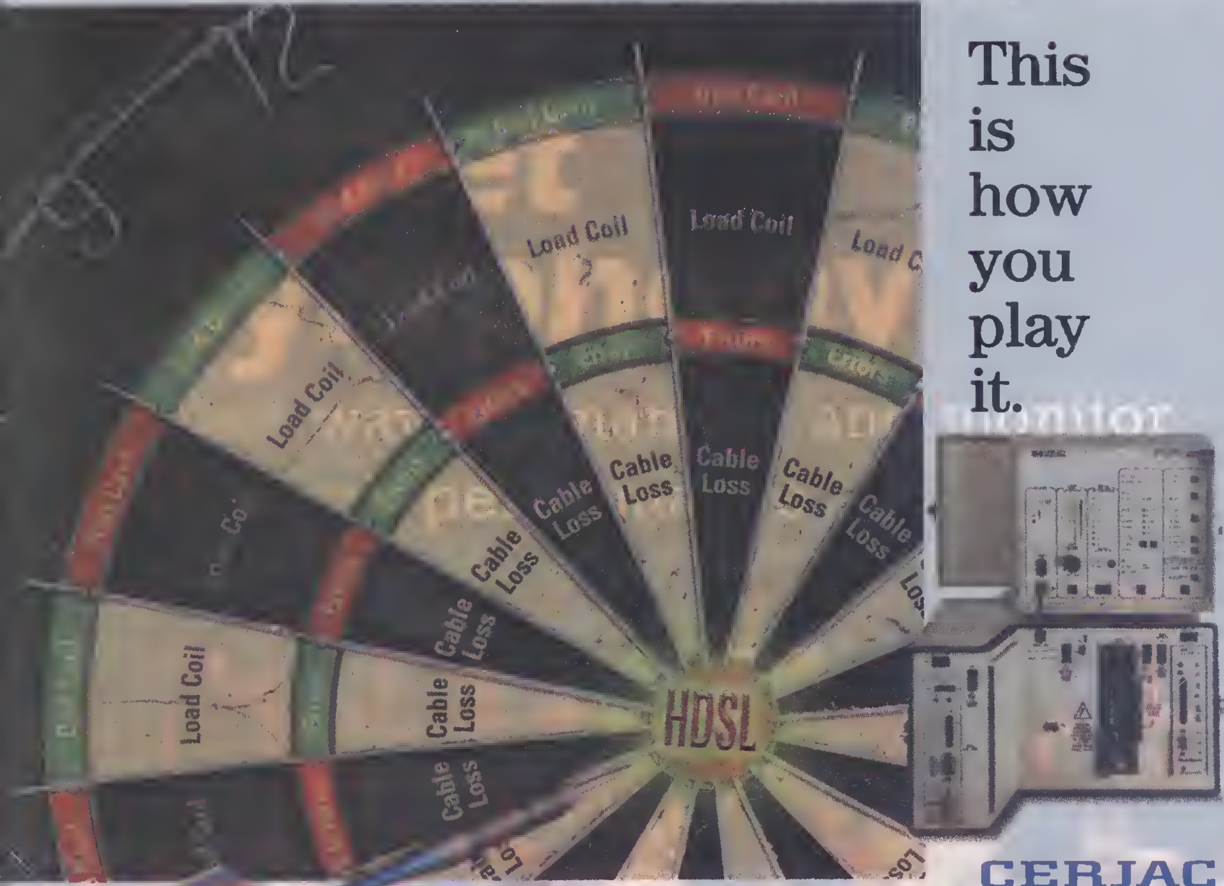
How the gel tolled for U S West ■ Plug-and-play ADSL deployment

America's Network

TECHNOLOGY FOR THE PUBLIC NETWORK SINCE 1[illegible]9

This is the game.

This is how you play it.



CERJAC
TELECOM TESTERS

The HP CERJAC HDSL Installer's Assistant®

See our ad inside for more on the HP CERJAC HDSL Installer's Assistant, the complete HDSL turn up test set, with everything you need to qualify HDSL lines.

Call 1-800-9CERJAC, contact your local HP representative or visit our web site at www.hp.com/go/hdslassistant.

HEWLETT® PACKARD

AN ADVANSTAR PUBLICATION